SINGER
INSTRUMENTATION

MAINTENANCE MANUAL
for
OSCILLOSCOPE DEVIATION MONITOR MODULE

MODEL ODM-1
(For use with Models FM-10 or FM-10C Mainframes)

Manual No. 1-500783-299
(For Use with Serial Numbers 101 and Above)

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This manual refers directly to serial numbers suffixed with 04296 and above.

Appendix A, Manual Backdating Information, adapts this manual to serial numbers 101 thru serial numbers suffixed with 04295.

For operating instructions refer to either Model FM-10 Operator's Manual No. 1-500783-286, or Model FM-10C Operator's Manual No. 1-500783-258 (Rev B) or later.

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CONTENTS (Cont.)

Section			Page No.
II	MAINTENANCE (Cont.)		
	2.6	Fault Isolation Procedures	2-8
	2.6.1	No Trace (2.4.1-g.)	2-9
	2.6.2	Vertical Centering Defective (2.4.1-g.)	2-9
	2.6.3	Horizontal Centering Defective (2.4.1-g.)	2-9
	2.6.4	Focus Defective (2.4.1-h.)	2-9
	2.6.5	Intensity Defective (2.4.1-h.)	2-9
	2.6.6	Vertical Center Control Defective (2.4.2-b.)	2-9
	2.6.7	Horizontal Center Control Defective (2.4.2-e.)	2-9
	2.6.8	Sweep Speed Cannot Adjust Below 50 Hz on Low Range (2.4.3-h.)	2-9
	2.6.9	Sweep Speed Cannot Adjust Above 5000 Hz on High Range (2.4.3-l.)	2-10
	2.6.10	Sweep Speed Cannot Adjust Below 500 Hz on High Range (2.4.3-o.)	2-10
	2.6.11	Sweep Speed Cannot Adjust Above 500 Hz on Low Range (2.4.3-s.)	2-10
	2.6.12	External Vertical Input Sensitivity Not Within Specification (2.4.4-d.)	2-10
	2.6.13	Vertical Amplifier Frequency Response Not Within Specification (2.4.5-d.)	2-10
	2.6.14	Operate Indicator Sensitivity Not Within Specification (2.4.6-h.)	2-10
	2.6.15	Overload Indicator Sensitivity Not Within Specification (2.4.6-i.)	2-10
	2.6.16	5 kHz Range Gain Not Within Specification (2.4.7-h)	2-10
	2.6.17	15 kHz Range Gain Not Within Specification (2.4.7-l.)	2-10
	2.6.18	Insufficient Vertical Amplitude at 15 kHz (2.4.8-d.)	2-10
	2.6.19	Insufficient Vertical Amplitude at 5 kHz in External Mode (2.4.9-g.)	2-10
	2.6.20	External Horizontal Sensitivity Not Within Specification (2.4.10-c.)	2-11
	2.6.21	Audio Output Frequency Not Within Specification (2.4.11-e.)	2-11
	2.6.22	Audio Output Level Not Within Specification (2.4.11-e.)	2-11
	2.6.23	Audio Distortion Not Within Specification (2.4.11-g.)	2-11
III	REPLACEABLE PARTS		
	3.1	Introduction	3-1
IV	SCHEMATIC DIAGRAMS		4-1

APPENDIX

Appendix		Page No.
A	Backdating Information	A-1

TABLES

Table		Page No.
2-1	Test Equipment Requirements	2-2
3-1	Parts List for Main Assemblies and Chassis	3-2
3-2	Parts List for IF Assembly, A1	3-5
3-3	Parts List for High Voltage Power Supply Assembly, A2	3-12
3-4	Parts List for Vertical Amplifier Assembly, A3	3-13
3-5	Parts List for Horizontal Amplifier Assembly, A4	3-15
3-6	Code List of Manufacturers	3-17

CONTENTS (Cont.)

ILLUSTRATIONS

Figure		Page No.
1-1	Detailed Block Diagram, Model ODM-1	1-3
2-1	Test Connector Schematic Diagram	2-5
2-2	Trimmer Locations, Vertical Amplifier Assembly, A3	2-5
2-3	Trimmer Locations, Horizontal Amplifier Assembly, A4	2-6
2-4	BNC Test Cable/Capacitor Schematic Diagram	2-6
2-5	Center Frequency Adjustment Waveform	2-6
2-6	Trimmer Locations, If Amplifier Assembly, A1	2-6
2-7	Bandwidth Adjustment Waveform	2-7
2-8	Trimmer Locations, Power Supply Assembly, A2	2-9
4-1	Schematic Diagram, Model ODM-1	4-3

Section I
THEORY OF OPERATION

1.1 INTRODUCTION

This section consists of the circuit description of the Model ODM-1 plug-in module. The information is presented to assist the user in the troubleshooting and maintenance of the instrument. Refer to the Detailed Block Diagram, Figure 1-1 and the Schematic Diagram, Figure 4-1.

1.2 GENERAL

The Model ODM-1 plug-in module derives its operating power and signal input from the Mainframe via the rear connector, P1. It contains its own power switch to permit use of the Mainframe while the plug-in module is switched off. High voltage power supplies for the CRT are also developed within the module. There are four subassemblies in the Model ODM-1: 2 MHz IF assembly, A1, high voltage power supply assembly, A2, vertical amplifier assembly, A3, and horizontal amplifier assembly, A4. The circuitry contained in the Model ODM-1 may be divided into six sections: operate and overload lamp circuitry, discriminator output circuitry, vertical deflection circuitry, horizontal deflection circuitry, internal modulation circuitry and power supply circuitry.

1.3 DETAILED THEORY

1.3.1 Operate and Overload Lamp Circuitry

A 2 MHz active filter consisting of A1Q501, A1L501, A1L502, and A1L503 amplifies and filters the 2 MHz IF signal at connector, P1-16. The amplifier output is buffered by A1Q503 and amplified by A1Q504. Level detector, CR502, Q505, C526, rectifies the IF signal and this output is applied to two potentiometers, A1R527 and A1R528. Potentiometer A1R528 is adjusted to fire the operate lamp schmidt trigger, A1Q506, A1Q507, when the level of the 2 MHz at connector, P1-16 is 2.5 mV. This triggers the operate lamp switch, A1Q508, and the OPER lamp, DS1, lights. A1R527 is adjusted to fire the overload schmidt trigger, A1Q509, A1Q510, with 25 mV rms (2.5 mV rms +20 dB) at the 2 MHz IF input at connector, P1-16, which triggers the overload lamp switch, A1Q511, and the OVLD lamp, DS2, lights. Interlock diode, A1CR503, prevents both lamps from being lit simultaneously.

1.3.2 Discriminator Output Circuitry

The output of the 2 MHz active filter is also applied to the limiter-discriminator, A1U501. The demodulated output is buffered by A1Q502 and applied to connector, P1-5. The buffered output of A1Q502 is also amplified by the distortion analyzer amplifier, A3Q105, for use at the DIST ANAL output receptacle, J2.

1.3.3 Vertical Deflection Circuitry

The output of the limiter-discriminator, A1U501, is also applied to the voltage divider string, R2, R3, R4, through DC BAL potentiometer, R32. DEV RANGE switch, S2, selects a voltage from the voltage divider string and when the VERT IN switch, S1, is in the INT position. The recovered audio is amplified by the recovered audio amplifier, A1Q512, A1Q513, A1Q514, and applied to the Mainframe via connector, P1-14.

The signal level selected by the DEV RANGE switch, S2, is applied to the vertical deflection amplifier, A3Q101, A3U101, A3Q103, A3Q104, and VERT CENT control, R9, sets the bias of A3U101B. A3Q102 and A3U101C are constant current sources for the vertical deflection amplifier. VERT COUPLING switch, S6, enables dc or ac coupling to be selected by inserting capacitor, C1, into the circuit when in the AC position of the switch.

1.3.4 Horizontal Deflection Circuitry

The sweep generator contains a current source, A4Q200, and a regenerative trigger, A4Q201, A4Q202. Sweep speed is controlled by SWEEP RANGE switch, S3, and SWEEP SPEED control, R11. The output level is controlled by variable resistor, A4R204. Synchronization is provided by the vertical signal output of A3Q104. The sweep generator output is applied to buffer amplifier, A4Q203, when MOD MODE switch, S4, is in either the INT or EXT position. The output of buffer amplifier, A4Q203, is applied to the dc-coupled horizontal deflection amplifier, A4Q204, A4Q205, having differential outputs which drive the horizontal deflection plates of the CRT. HORIZ CENTER control, R12, sets the bias of A4Q205. The horizontal amplifier may be driven from an external source connected to the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S4, is in the EXT HORIZ position. The Mainframe may be modulated from the EXT MOD/HORIZ IN receptacle, J4, when the MOD MODE switch, S4, is in either the EXT or INT COMB positions via the modulation amplifier, A3U102, through connector, P1-12.

1.3.5 Internal Modulator Circuitry

The 1 kHz Wein-bridge oscillator, A1Q515, A1Q516, is buffered by A1Q517 and automatically leveled by level detector, A1CR504, A1CR505, and ALC control, A1Q518. The output of the oscillator is applied to the INT MOD/AUDIO OUT control, R13. The wiper of R13 is connected to the audio driver amplifier, A1Q519, A1Q520. The output of A1Q520 is applied to the AUDIO OUT receptacle, J3. When the MOD MODE switch, S4, is in the INT/COMB position, the output from the Wein-bridge oscillator is amplified by the modulation amplifier, A3U102 and applied to the Mainframe through connector, P1-12.

1.3.6 Power Supply Circuitry

The power supply is a dc-to-dc inverter that converts +9 volts from the Mainframe when the PWR OFF switch, S1, is closed to −1000 volts and +300 volts required by the CRT. The inverter also supplies −15 volts required by the vertical and horizontal deflection amplifiers and 2 MHz IF assembly. The 6.3 V rms required by the CRT heater is also supplied. The inverter consists of a 20 kHz oscillator, Q1, Q2, a power transformer, T401, and three voltage doublers, A2CR401, A2CR402, A2CR403, A2CR404, and A2CR405, A2CR406. The astigmatism control, A4R217, utilizes the +300 V dc while the FOCUS and INTENSITY controls, R21 and R18 respectively, require the −1000 V dc.

Section II
MAINTENANCE

2.1 INTRODUCTION

This section contains information for the maintenance of the Model ODM-1. Included are Minimum Performance Procedures, Alignment and Adjustment Procedures and Fault Isolation Procedures.

All ac and dc voltages displayed without tolerances on the Schematic Diagram in Section IV are typical. The dc voltages may vary widely (+100%, −50%) and the ac voltages may vary widely (±6 dB) due to component tolerances and beta ranges of the transistors. This does not imply that instruments in which measured voltages are at the tolerance extremes will not perform to the specifications, since the instrument has been designed to allow for these tolerances.

NOTE

The procedures in this section are related directly for use with the Model FM-10 Mainframe. Where procedures deviate for use with Model FM-10C Mainframe, the information is provided in brackets, e.g. [. . .].

2.2 PRELIMINARY INFORMATION

2.2.1 Alignment Interval

To ensure instrument accuracy check the Model ODM-1 performance using the Minimum Performance Procedures every 1000 hours of operation, or every six months if used occasionally.

2.2.2 Singer Customer Service

Both Factory and Field Centers provide instrument service and repair. Contact your local Singer representative for additional information.

2.2.3 Minimum Performance Procedures Defined

The performance of the instrument can be checked without removing the covers or performing internal adjustments by the use of the Minimum Performance Procedures. Refer to Paragraph 2.4. These procedures do not test every detail of the alignment of the instrument but do check the overall performance for accuracy and correct operation within allowable tolerances.

2.2.4 Alignment and Adjustment Procedures Defined

The completion of each step of the Alignment and Adjustment Procedure (refer to Paragraph 2.5) ensures that the instrument meets the electrical specifications provided in Section II of the Operator's Manual. For best overall instrument performance when performing a complete Alignment and Adjustment Procedure, adjust each trimmer as close as possible to the exact Figure, even though the Minimum Performance Procedures indicate that the operation is within the allowable tolerance.

2.2.5 Interchangeability

The plug-in module interfaces have been designed to provide full interchangeability when both modules and Mainframes have been correctly aligned and adjusted. Factory procedures require numerous standard signal sources and standardized test fixtures to ensure interchangeability. However, to avoid excessive equipment requirements for field maintenance, this procedure utilizes some signals and power from the Mainframe, with certain steps included, that are identified by placing parentheses around the step; e.g. (a.), to verify Mainframe standardization and thus maintain interchangeability. A Mainframe standardized to these requirements may be retained as a module testing fixture if interchangeability is required. However, if the Mainframe and module under test are intended to be used together exclusively with no need for interchangeability, the procedure may be shortened by omitting these standardization steps.

2.3 TEST EQUIPMENT REQUIRED

The test equipment required for the Minimum Performance Procedures, Alignment and Adjustment Procedures, and Fault Isolation Procedures is listed in Table 2-1. Minimum Specifications are provided to aid in the selection of equivalent types.

2.4 MINIMUM PERFORMANCE PROCEDURES

The Minimum Performance Procedures provide a convenient verification of overall performance of the main functions of the Model ODM-1 when installed in a Model FM-10 or Model FM-10C Mainframe, and may be used initially to determine the need for alignment and adjustment and also to verify overall performance upon the completion of Alignment and Adjustment Procedure.

Since this procedure is performed with the module plugged into a Mainframe, the results may be influenced by the alignment and adjustment of the individual mainframe unless it has been standardized. (Refer to Paragraph 2.2.5, Interchangeability.)

NOTE

The equipment should be checked at a temperature of 25°C ±5°C for best overall performance.

2.4.1 Evaluation of Focus and Intensity

a. Install the Model ODM-1 into the right-hand compartment of the Mainframe. Set PWR OFF switch on.

b. Set INTENSITY control fully cw.

c. Set FOCUS control to mid-range.

d. Set VERT IN switch to EXT.

e. Set MOD MODE switch to INT/COMB.

f. Allow 5 to 10 seconds for the CRT filament to warm up.

g. Vary VERT CENTER and HORIZ CENTER controls until CRT trace is centered.

Table 2-1. Test Equipment Requirements — Model ODM-1

Instrument	Minimum Specifications	Recommended		Use*
		Manufacturer	Model	
Audio oscillator	Frequency response: 45 Hz to 30 kHz Output level: 25 mV to 400 mV rms	Hewlett-Packard	200CD	M
Ac voltmeter	Frequency response: 50 Hz to 2 MHz Input level: 100 mV to 400 mV rms Input resistance: 1 megohm, minimum Input capacitance: 35 pF maximum	Hewlett-Packard	400D	A,M
Signal generator/ Peak deviation monitor	Frequency range: 25 MHz to 150 MHz Output impedance: 50 ohm nominal Output level: 6 mV rms to 60 mV rms Stability: ±0.0004%/5 min. minimum Leveling: ±1.0 dB	Singer	FM-2748 with ODM-1	A,M
Oscilloscope with 1X probe	Frequency response: 2 MHz Vertical sensitivity: 5 mV/cm	Tektronix	531 with 53/54B plug-in	A
Distortion analyzer	Frequency response: 1 kHz Input level: 1.0 V rms Accuracy: ±0.1%	Hewlett-Packard	333A	A,M
Frequency counter	Frequency response: 1 kHz Input level: 1.0V rms	Hewlett-Packard	5512A	A
VOM	Input level: 0 to 1100 V dc	Simpson	269	A
Dc digital voltmeter	Input level: 1 mV to 1000 mV dc Accuracy: ±0.1% of indication	Hewlett-Packard	3440A	A
Sweep generator	Frequency range: 2 MHz Output level: −27 dBm	Wavetek	2001	A
Dc power supply	Output level: 9 V dc at 1.0 Amp.	Hewlett-Packard	6214A	A,M
Mainframe	Required for testing Model ODM-1 module	Singer	FM-10 with AFM-2 module or FM-10C with RFM and FIM modules	A,M
Extender cable	Required for testing Model ODM-1 module	Singer	PC2653	A
Connector	16 pin	Amphenol	26-190-16	A
Capacitors	0.1uF, 100 uF	Not applicable		A
Resistors	16 ohm (3), 62 ohm, 100 ohm, 180 ohm, 200 ohm, 560 ohm (all ±5%, 1/4 watt)	Not applicable		A,M
Modulation module	Required for testing Model ODM-1 with Model FM-10 Mainframe	Singer	AFM-2	M

*A = Alignment and Adjustment and Fault Isolation

M = Minimum Performance

h. Vary FOCUS and INTENSITY controls for sharpest trace with adequate intensity.

j. Verify that CRT trace is bright enough to be visible in a normally-lit room. Verify that FOCUS, VERT CENTER, and HORIZ CENTER controls are approximately at mid-range.

2.4.2 Evaluation of Vertical and Horizontal Center Control Range

a. Rotate VERT CENTER control from fully cw to fully ccw.

b. Verify that CRT trace deflects beyond calibrated portion of graticule vertically when VERT CENTER control is rotated throughout its range.

c. Return VERT CENTER control to mid-range.

d. Rotate HORIZ CENTER control from fully cw to full ccw.

e. Verify that ends of trace deflect horizontally to at least mid-screen when HORIZ CENTER control is rotated throughout its range.

f. Return HORIZ CENTER control to mid-range.

g. Verify that trace is centered on CRT with controls set at approximately mid-range.

2.4.3 Evaluation of Sweep Range

a. Rotate VERT GAIN control fully cw.

b. Set VERT IN switch to EXT.

c. Connect audio oscillator and ac voltmeter to VERT IN receptacle.

d. Set audio oscillator frequency to 50 Hz and set ac voltmeter to 30 mV scale.

e. Rotate SWEEP SPEED control fully ccw.

f. Set SWEEP RANGE switch to LO.

g. Increase audio oscillator output level until sine wave on CRT deflects to full-scale. Vary audio oscillator frequency for a stationary, one-cycle sine wave on CRT.

h. Verify that audio oscillator frequency is less than 50 Hz (approximately 45 Hz).

i. Rotate SWEEP SPEED control fully cw.

j. Set SWEEP RANGE switch to HI.

k. Vary audio oscillator frequency for a stationary, one-cycle sine wave on CRT.

l. Verify that audio oscillator frequency is greater than 5 kHz and deflects across entire CRT.

m. Rotate SWEEP SPEED control fully ccw.

n. Vary audio oscillator frequency for a stationary, one-cycle sine wave on CRT.

o. Verify that audio oscillator frequency is less than 500 Hz (approximately 450 Hz).

p. Set SWEEP RANGE switch to LO.

q. Rotate SWEEP SPEED control fully ccw.

r. Vary audio oscillator frequency for a stationary, one-cycle sine wave.

s. Verify that audio oscillator frequency is greater than 500 Hz (approximately 550 Hz).

2.4.4 Evaluation of Vertical Sensitivity

a. Set audio oscillator frequency to 1 kHz.

b. Set SWEEP RANGE switch and vary SWEEP SPEED control for a stationary pattern on CRT.

c. Vary output level of audio oscillator for full-scale deflection on CRT.

d. Verify that audio oscillator output level is between 22 mV and 27 mV rms.

2.4.5 Evaluation of Vertical Amplifier Frequency Response

a. Vary audio oscillator output level to obtain exactly full-scale deflection on CRT at 1 kHz frequency.

b. Increase audio oscillator frequency to 30 kHz and note p-p deflection on CRT.

c. Decrease audio oscillator frequency to 50 Hz and note p-p deflection on CRT.

d. Verify that signal on CRT did not change more than 3 dB (less than 3 divisions p-p) from 50 Hz to 30 kHz.

2.4.6 Evaluation of Measure Indicator Sensitivity

(a.) Install a Model AFM-2 in the Model FM-10 Mainframe [With Model FM-10C Mainframe disregard this step.]

b. Connect signal generator to the left-hand module MEASURE INPUT receptacle and set signal generator frequency to 151 MHz. [With Model FM-10C set the left-hand module to maximum sensitivity.]

(c.) Connect the ac voltmeter to the IF OUTPUT receptacle of the AFM-2 to monitor the 2 MHz IF output level. [With Model FM-10C connect the ac voltmeter to the back panel ACC receptacle Pin A.]

d. Set the Mainframe Frequency switches to 153.000 MHz, 0-1 kHz control to OUT. Zero beat for accuracy. [With Model FM-10C set Frequency switches to 151.0000 MHz, 0-100 Hz control to OUT.]

(e.) Vary the signal generator output level to obtain exactly 2.5 mV indicated on the ac voltmeter. Note this signal generator output level for Step h. and i.

(f.) Remove the Model AFM-2 from the Mainframe [With Model FM-10C disregard this step].

g. Install the Model ODM-1 in the Mainframe.

h. Vary the signal generator output level to determine the turn-on threshold of the OPER indicator lamp. This level should be within ±1 dB of the level obtained in Step (e.). If Steps (a.), (c.) (e.) and (f.) are omitted, the level should be within ±3 dB of nominal sensitivity for the left-hand module.

i. Increase the generator output level approximately 20 dB and vary the level to determine the turn-on threshold of the OVLD indicator lamp. This level should be 20 dB ±2 dB above the level obtained in Step (e.). If Steps (a.), (c.), (e.) and (f.) have been omitted, the level should be 20 dB ±3 dB above the nominal sensitivity for the left-hand module.

2.4.7 Evaluation of Deviation Indication Accuracy

a. Set Model FM-10 Mainframe Frequency switches to 8 MHz, 0-1 kHz control to OUT, and 10 MHz switch to IN. [Set Model FM-10C Mainframe Frequency switches to 000.0000, 0-100 Hz control to OUT, and MODE switch to TONE GEN].

b. Set VERT IN switch to EXT, vary VERT CENTER control to position CRT trace exactly on the 0 line. Set VERT IN switch to INT and DEV RANGE switch to 1.5 kHz. Vary the DC BAL control to position CRT trace exactly on the 0 line.

c. Set Model FM-10 Mainframe Frequency switches to 008.002 MHz. Verify that the CRT trace deflects downward to the −20 kHz line ±1/2 division. [Set Model FM-10C Mainframe Frequency switches to 000.0015. Verify that the CRT trace deflects downward to the −15 kHz line ±1/2 division].

d. Set Model FM-10 Mainframe Frequency switches to 007.998 MHz. Verify that the CRT trace deflects upward to the 20 kHz line ±1/2 division. [With Model FM-10C disregard this Step].

e. Set the Model ODM-1 DEV RANGE switch to 5 kHz.

f. Set Model FM-10 Mainframe Frequency switches to 008.000 MHz. [Set Model FM-10C Mainframe Frequency switches to 000.0000 MHz]. Verify that CRT trace is exactly centered on 0. If not, repeat Step b.

g. Set Model FM-10 Mainframe Frequency switches to 008.005 MHz. [Set Model FM-10C Mainframe Frequency switches to 000.0050 MHz]. Verify that the CRT trace deflects downward to the −5 kHz line ±1/2 division.

h. Set Model FM-10 Mainframe Frequency switches to 007.995 MHz. Verify that the CRT trace deflects upward to the +5 kHz line ±1/2 division. [With Model FM-10C disregard this Step].

i. Set the Model ODM-1 DEV RANGE switch to 15 kHz.

j. Set Model FM-10 Mainframe Frequency switches to 008.000 MHz. [Set Model FM-10C Mainframe Frequency switches to 000.0000 MHz]. Verify that CRT trace is exactly centered on 0. If not, repeat Step b.

k. Set Model FM-10 Mainframe Frequency switches to 008.015 MHz. [Set Model FM-10C Mainframe Frequency switches to 000.0150 MHz]. Verify that the CRT trace deflects downward to the −15 kHz line ±1/2 division.

l. Set the Model FM-10 Mainframe Frequency switches to 007.985 MHz. Verify that the CRT trace deflects upward to the +15 kHz line ±1/2 division. [With Model FM-10C Mainframe set MODE switch to GEN MOD CAL, GENERATOR MODULATION switch ON (in) and vary the Model ODM-1 INT MOD control, SWEEP RANGE and SWEEP SPEED to display the 1 kHz waveform with its lower peak exactly on the −15 kHz line. Verify symmetry by checking that the upper peak is within ±1/2 division of the +15 kHz line].

2.4.8 Evaluation of Internal Modulation

a. Set Model FM-10 Mainframe Frequency switches to 8 MHz, 100 kHz Frequency switch to V, 0-1 kHz control to 0 (not OUT), and 10 MHz switch to IN. [Set Model FM-10C Mainframe MODE switch to GEN MOD CAL and GENERATOR MODULATION switch to IN/ON].

b. Set MOD MODE switch to INT/COMB.

c. Set DEV RANGE switch to 15 kHz.

d. Rotate INT MOD/AUDIO OUT control to fully cw and verify that trace exceeds full-scale deflection.

e. Vary INT MOD/AUDIO OUT control for full-scale deflection of CRT trace.

2.4.9 Evaluation of Internal/Combined and External Mode

a. Set Model FM-10 Mainframe Frequency switches to 8.0V0, 0-1 kHz Frequency control to 0 (not OUT), and 10 MHz switch to IN. [Set Model FM-10C Mainframe Frequency switches to 000.000, 0-100 Hz Frequency control to OUT, MODE switch to GEN MOD CAL, and GENERATOR MODULATION switch to IN/ON].

b. Set DEV RANGE switch to 5 kHz.

c. Vary INT MOD/AUDIO OUT control for a full-scale deflection of trace.

d. Set MOD MODE switch to EXT.

e. Connect audio oscillator to EXT MOD/HORIZ IN receptacle.

f. Set audio oscillator for a frequency of 1 kHz and vary output level for full-scale deflection on CRT.

g. Verify that audio oscillator output level is 400 mV rms ±10%. [80 mV rms ±20% for Model FM-10C Mainframes].

h. Set MOD MODE switch to INT/COMB and verify display of two 1 kHz signals beating.

2.4.10 Evaluation of External Horizontal Sweep Capability

a. Set MOD MODE switch to EXT HORIZ. Connect audio oscillator to EXT MOD/HORIZ IN receptacle and set frequency to 1 kHz.

b. Increase audio oscillator output level until trace is deflected beyond the full-scale of CRT.

c. Verify that amplitude required for full-scale deflection is less than 500 mV rms.

2.4.11 Evaluation of Audio Output Frequency, Level, and Distortion

a. Connect ac voltmeter and frequency counter to AUDIO OUT 1 kHz 600 Ω receptacle.

b. Connect a 600 ohm resistive load across the ac VTVM terminals.

c. Rotate INT MOD/AUDIO OUT control fully cw.

d. Note indications on ac voltmeter and frequency counter.

e. Verify that frequency is 1 kHz ±5%. Level should be 1.0 V rms minimum into 600 ohm.

f. Disconnect frequency counter from AUDIO OUT 1 kHz 600 Ω receptacle and connect distortion analyzer.

g. Calibrate distortion analyzer at 1 kHz and note the distortion. Distortion should be less than 1%.

2.5 ALIGNMENT AND ADJUSTMENT PROCEDURE

NOTE

The Alignment and Adjustment Procedure is performed with the Model ODM-1 disconnected from the mainframe so that any problem in the mainframe will not affect the alignment of the Model ODM-1. Remove the five screws from the back of the Model ODM-1 module and slide the cover off the back.

NOTE

The equipment should be checked at a temperature of 25°C ±5°C for best overall performance.

WARNING

High voltages are present throughout the instrument and appropriate precautions should be taken while operating the instrument with the cover removed.

2.5.1 Test Connector Wiring

a. See Figure 2-1 for schematic diagram of test connector wiring.

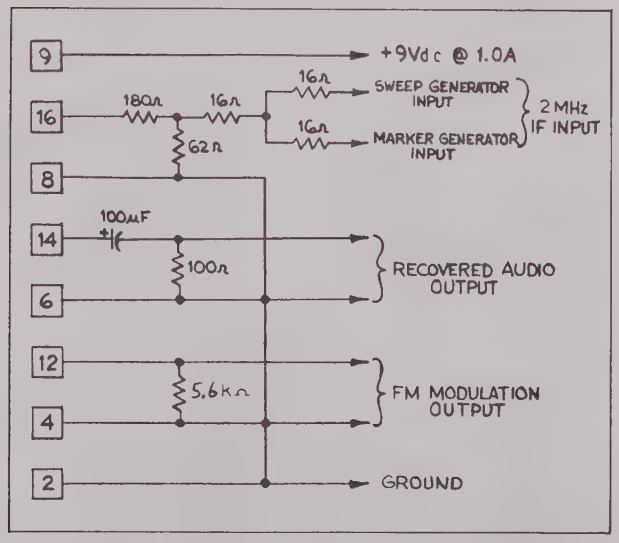

Figure 2-1. Test Connector Schematic Diagram

2.5.2 Location and Adjustment of Trace

a. Connect the test connector to the Model ODM-1 and set the Model ODM-1 controls as follows:

INTENSITY	Fully cw
VERT CENTER	Mid-range
VERT IN	EXT
MOD MODE	INT/COMB
HORIZ CENTER	Mid-range

b. Connect the VOM between pins E103 and E104 on the vertical amplifier assembly, A3. (See Figure 2-2).

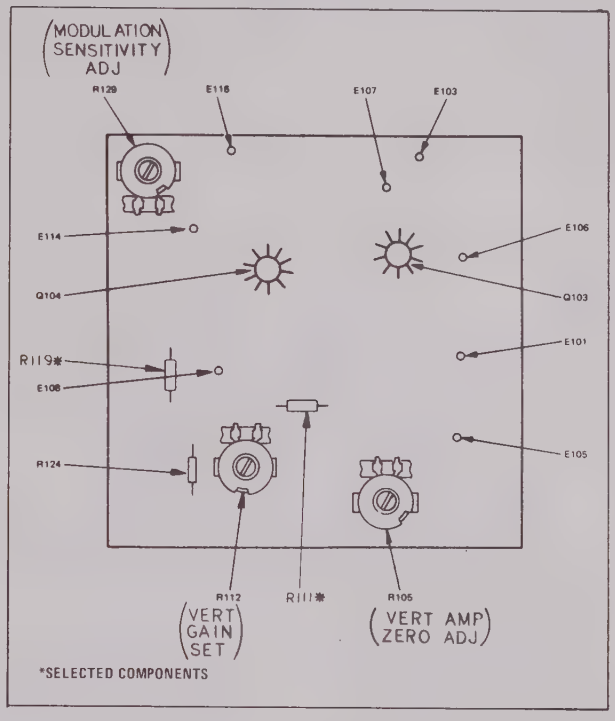

Figure 2-2. Trimmer Locations, Vertical Amplifier Assembly, A3

c. Adjust A3R105 for O V dc on the VOM.

d. The trace should be visible. If so, set the SWEEP RANGE switch to LO and the SWEEP SPEED control fully ccw.

e. If the trace is not visible, connect the VOM between pins E212 and E213 on the horizontal amplifier assembly, A4. Adjust the HORIZ CENTER control for 0 V dc on the VOM. (See Figure 2-3).

f. The trace should now be visible. If not, connect the digital voltmeter to pin A4E211 and ground. Adjust A4R217 (Astigmatism) for approximately +150 V dc on the digital voltmeter.

g. If the trace is still not visible, check the CRT socket wiring. If the wiring is correct, substitute another CRT.

2.5.3 IF Sweep Alignment

a. Connect the sweep generator RF output receptacle to the test connector "sweep generator" input.

b. Connect the frequency source RF output receptacle to the test connector "marker generator" input.

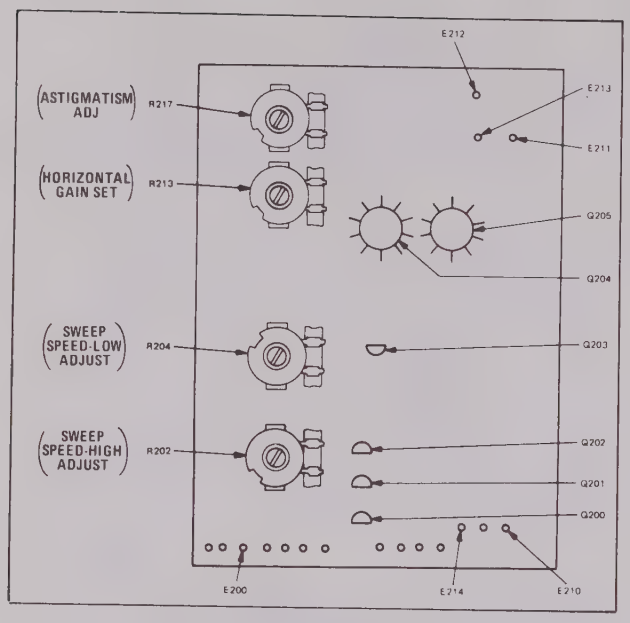

Figure 2-3. Trimmer Locations, Horizontal Amplifier Assembly, A4

c. Connect the BNC test cable via the 0.1 uF capacitor to A1TP2. Connect the BNC end to the oscilloscope vertical input receptacle. (Figure 2-4)

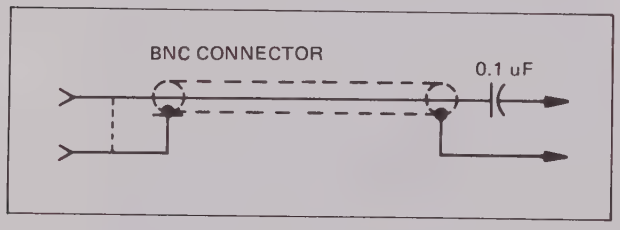

Figure 2-4. BNC Test Cable/ Capacitor Schematic Diagram

d. Connect the sweep generator horizontal output receptacle to the oscilloscope external horizontal input receptacle.

e. Set the sweep generator to sweep between 1.95 MHz and 2.05 MHz and RF output level to approximately –27 dBm.

f. On the oscilloscope, set the horizontal display switch to external and the external horizontal attenuator as necessary to display the response curve, set the time/centmeter switch to 2 sec., and vary the vertical sensitivity as necessary to display the response curve.

g. Set the frequency source to 2 MHz and adjust its output level for a visible marker on the oscilloscope. Vary the sweep generator center frequency and sweep width controls so that the response curve is centered on the oscilloscope and has approximately the same width as in Figure 2-5.

h. Adjust A1L501, A1L502 and A1L503 for maximum amplitude and to set the center of the response curve on the 2 MHz marker.

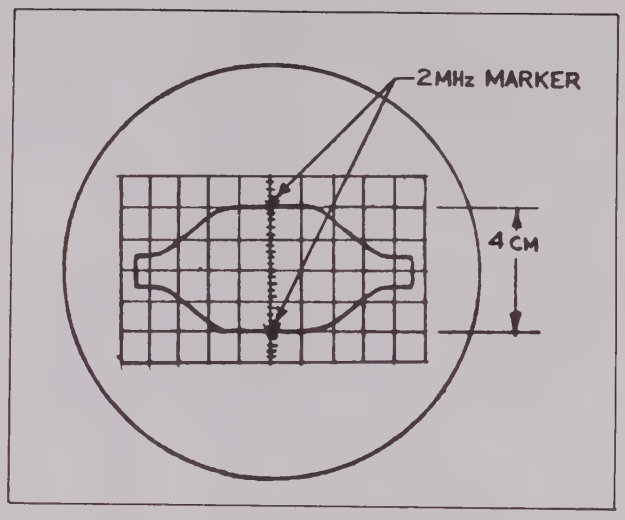

Figure 2-5. Center Frequency Adjustment Waveform

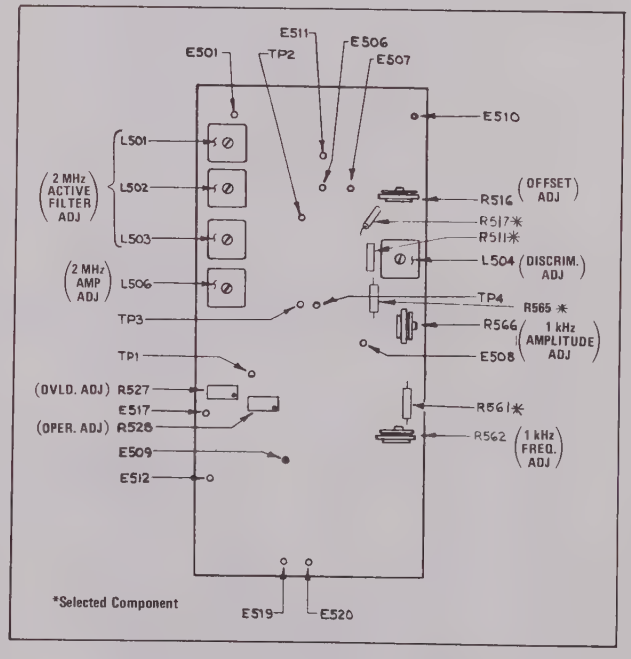

Figure 2-6. Trimmer Locations, IF Amplifier Assembly, A1

i. Adjust A1L502 and A1L503 for the flattest response and optimum balance on both sides of the 2 MHz marker.

j. Vary the oscilloscope vertical sensitivity so that the response curve is vertically deflected 4 cm.

k. Set the frequency source frequency to 1.975 MHz and 2.025 MHz alternately and verify that the markers are not down on the slopes more than 3 dB (70% of maximum deflection). (Figure 2-7)

l. Disconnect the BNC test cable from the oscilloscope vertical input receptacle and connect the 1X probe.

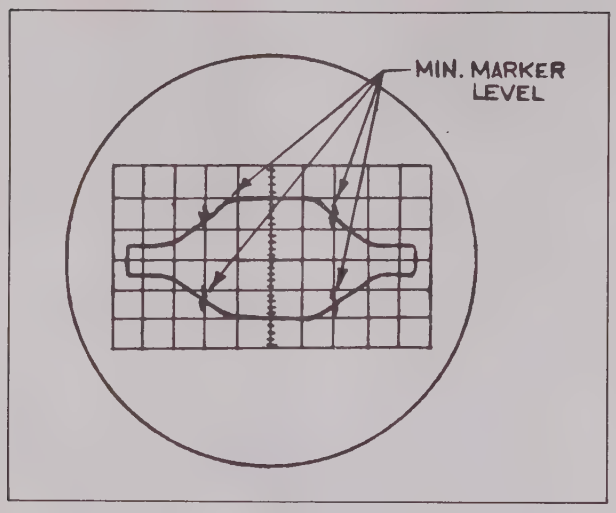

Figure 2-7. Bandwidth Adjustment Waveform

m. Connect the 1X probe to A1E518 and verify that an "S" curve is present.

n. Disconnect the sweep generator from the test connector and connect the ac voltmeter to A1E501. Set the frequency generator output level for 2.5 mV rms on the ac voltmeter.

o. Connect the oscilloscope probe to A1TP3 and verify that a square wave of approximately 1.4 V p-p is present.

p. Connect the oscilloscope probe to A1TP4 and verify that 2 MHz sine wave is present with pips near the peaks. Adjust A1L504 so that the pips are exactly on the peaks of the sine wave.

2.5.4 Level Detector Adjustment

a. Connect the digital voltmeter to A1TP1 and adjust A1L506 for maximum voltage on the digital voltmeter. It should be 1.8 V dc minimum.

b. Adjust A1R528 until the OPER lamp just lights.

c. Set the signal generator output level to 25 mV rms at A1E501.

d. Adjust A1R527 until the OVLD lamp just lights. The OPER lamp should be extinguished.

e. Repeat Steps b. thru d. until both lamps function as described.

f. Repeat Step b. and adjust A1L506 slightly in both directions while observing the OPER lamp. If more than 1/2 turn in either direction is required before the OPER lamp extinguishes repeat Steps b. thru f.

2.5.5 Trace Alignment and Focus

a. Loosen the CRT clamp screw and set the trace on the 0 center line of the CRT graticule with the VERT CENTER control.

b. Grasp the large end of the CRT (away from the high voltage) and rotate it until the trace is parallel to the 0 center line, then rotate it so that the right-hand end of the trace is 1/3 division above the 0 center line. This is to compensate for cw rotation of the CRT when the clamp screw is tightened. Tighten the clamp screw.

c. Repeat Step a. and b. as necessary to align trace exactly parallel with the 0 center line.

d. Set the FOCUS control to mid-range and adjust A4R217 (Astigmatism) for the sharpest trace.

2.5.6 Offset and Vertical Amplifier Gain Adjustment

a. Set the VERT IN switch to EXT, VERT COUPLING switch to DC and set the VERT CENTER and DC BAL controls to the mid-range positions.

b. Set the DEV RANGE switch to 5 kHz. Adjust A3R105 (vertical position) to position the trace on the 0 center line.

c. Set the signal generator frequency to 2.0 MHz and output level to 2.5 mV rms.

d. Set the VERT IN switch to INT and adjust A1R516 (offset adjust) to position the trace on the 0 center line. If unable to position the trace on the 0 center line, select the value of A1R517.

e. Connect the digital voltmeter to A1E507 and verify the presence of 0 V dc ±0.1 V dc.

f. Set the signal generator frequency to 2.005 MHz and note the indication on the digital voltmeter.

g. Set the signal generator frequency to 1.995 MHz and note the indication on the digital voltmeter.

h. The voltage deviations obtained in Steps f. and g. should be equal above and below the voltage measured in Step e. If they are unequal, adjust A1L504 to add or subtract 1/2 the inequality and repeat Steps e. thru g. until this condition is met.

i. Set the VERT IN switch to EXT and adjust A3R105 to position the trace on the 0 center line.

j. Set the signal generator frequency to 2.005 MHz.

k. Set the VERT IN switch to INT and adjust A3R112 (vertical gain) to position the trace on the +5 kHz line.

l. Repeat Step i.

m. Repeat Steps i., k. and l. until the conditions are met, because A3R105 and A3R112 interact with one another.

n. Set the signal generator frequency to 1.995 MHz.

o. Set the VERT IN switch to INT. The trace should be on the −5 kHz line of the graticule. If it is not, repeat Steps d. thru n. until the conditions are met.

p. Set the signal generator frequency to 2.0 MHz.

q. Set the DEV RANGE switch to the 1.5 kHz and 15 kHz positions. Verify that the trace remains on the 0 center line ±1/2 division.

2.5.7 External Vertical Gain Adjustment

a. Set the VERT IN switch to EXT, VERT GAIN control to fully cw, VERT CENTER control to position trace on 0 center line of the CRT and VERT COUPLING switch to the AC position.

b. Connect the ac VTVM and the audio oscillator to the VERT IN receptacle.

c. Set the audio oscillator frequency to 1 kHz and output level to produce full-scale deflection on the CRT.

d. The ac voltmeter should indicate 25 mV rms ±10% (22.5 mV to 27.5 mV rms).

e. If the level required for full-scale deflection is less than 22.5 mV rms, increase the value of A1R511 from 9.1 kilohm to 10 kilohm. Disconnect the audio oscillator and repeat Steps 2.4.4-a. thru 2.4.7-d.

f. If the level required for full-scale deflection is greater than 27.5 mV rms, decrease the value of A1R511 from 9.1 kilohm to 8.2 kilohm. Disconnect the audio oscillator and repeat Steps 2.4.4-a. thru 2.4.7-d.

g. Repeat Steps a. thru f. with the VERT COUPLING switch in the DC position.

2.5.8 Sweep Range Adjustment

a. Set the Model ODM-1 controls as follows:

VERT CENTER	To center trace on graticule
HORIZ CENTER	To center trace on graticule
SWEEP RANGE	LO
SWEEP SPEED	Fully ccw
VERT IN	EXT
VERT GAIN	Fully cw

b. Connect the audio oscillator to the VERT IN receptacle. Set the audio oscillator frequency to 45 Hz and adjust its output level for full-scale deflection on the CRT.

c. Adjust A4R204 for a one-cycle stationary display on the CRT.

d. Set the oscillator frequency to 5.2 kHz. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control fully cw.

e. Adjust A4R202 for a one-cycle stationary display on the CRT.

f. Repeat Step c. thru e.

g. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control to fully ccw. Vary the audio oscillator frequency control to produce a one-cycle stationary display.

h. The audio oscillator frequency should be less than 500 Hz.

i. Set the SWEEP RANGE switch to LO and the SWEEP SPEED control to fully cw.

j. Vary the audio oscillator control to produce a one-cycle stationary display.

k. The audio oscillator frequency should be greater than 500 Hz.

l. Set the SWEEP RANGE switch to HI and the SWEEP SPEED control fully cw.

m. Set audio oscillator frequency to 1 kHz.

n. Adjust A4R213 until the trace extends slightly beyond the edges of the CRT.

2.5.9 Modulation Oscillator Adjustment

a. Connect the ac voltmeter (with 560 ohm resistor across terminals), frequency counter and distortion analyzer to the AUDIO OUT receptacle.

b. Set the INT MOD/AUDIO OUT control fully cw.

c. Adjust A1R562 for 1 kHz ±1 Hz on the frequency counter. If not enough range, select the value of A1R561.

d. Adjust A1R566 for 1.15 V rms on the ac voltmeter. If not enough range, select the value of A1R565.

e. Repeat Steps c. and d. until both are as specified.

f. Set the output level to 1.0 V rms with the INT MOD/AUDIO OUT control. Calibrate the distortion analyzer at 1 kHz and measure the distortion. The distortion should be less than 1%.

g. Disconnect the equipment installed in Step a.

2.5.10 Modulation Sensitivity Adjustment

a. Connect the ac voltmeter to the EXT MOD/HORIZ IN receptacle and vary the audio oscillator output level for 400 mV rms ±0.5%.

b. Connect the ac voltmeter across the 5.6 kilohm, resistor on the test connector.

c. Adjust A3R129 for 500 mV rms ±0.5% indication on the ac voltmeter.

2.5.11 Distortion Analyzer Amplifier Adjustment

a. Connect the digital voltmeter to pin 2 of the DIST ANAL receptacle and verify that +9 V dc ±1% is present.

b. Connect the digital voltmeter to pin 4 of the DIST ANAL receptacle.

c. Select the value of A3R119 to obtain +4.50 V dc ±0.25 V on the digital voltmeter.

2.6 FAULT ISOLATION PROCEDURES

Fault Isolation Procedures are presented to provide a guide in servicing the Model ODM-1. The procedures follow the sequence of the Minimum Performance Procedures, Paragraph 2.4, with each subsection keyed to the step in Paragraph 2.4 that first indicates a fault. When a fault is noted during Model ODM-1 operation, proceed as follows:

a. Perform Minimum Performance Procedures in Paragraph 2.4.

b. Start Fault Isolation Procedures at the point where minimum performance cannot be satisfied.

c. When the fault is isolated to a function, such as the discriminator, refer to the alignment procedure for that function in Paragraph 2.5, and check alignment of function before proceeding with fault isolation.

d. After a fault is repaired, complete the Minimum Performance Procedures to determine if further alignment is necessary.

WARNING

High voltages are present throughout the instrument. Appropriate precautions should be taken while operating the instrument with the cover removed.

2.6.1 No Trace (2.4.1-g.)

a. Remove socket from V1 (CRT) and check V1 voltages as displayed on Figure 4-1.

b. If voltages are within tolerance, replace V1.

c. If any voltage is absent or out of tolerance, check voltage source on assembly A2, A3, or A4 output terminals. (See Figure 2-8).

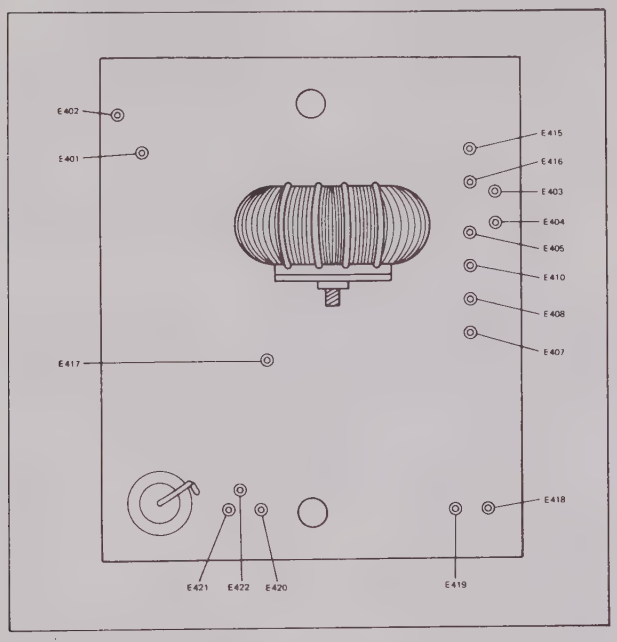

Figure 2-8. Trimmer Locations, Power Supply Assembly, A2

d. If voltages are within tolerance at A2, A3, or A4 output terminals check wiring harness for open or shorted leads.

e. If any voltage is absent or out of tolerance at output terminals of A2, A3, or A4 use voltages and waveforms displayed on Figure 4-1 to isolate the fault.

2.6.2 Vertical Centering Defective (2.4.1-g.)

a. Check voltages at V1-9 and V1-10. Voltage should vary over an 80 V minimum span within the range of +95 V dc to +235 V dc as the VERT CENTER control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at A3E119. This voltage should vary from less than +0.1 V dc to greater than +2.3 V dc as the VERT CENTER control is rotated throughout its range.

d. If voltage at A3E119 is within tolerance, use voltages and waveforms on Figure 4-1 to isolate fault on assembly, A3.

e. If voltage at A3E119 is not within tolerance, check R8, R9 and associated wiring.

2.6.3 Horizontal Centering Defective (2.4.1-g.)

a. Check voltages at V1-6 and V1-7. Voltages should vary over a 240 V minimum span within the range of 0 V dc to +330 V dc as the HORIZ CENTER control is rotated throughout its range.

b. If voltages are within tolerance, replace V1.

c. If voltages are not within tolerance, check voltage at A4E208. This voltage should vary from 0 V dc to +4.8 V dc nominal as HORIZ CENTER control, R12, is rotated throughout its range.

d. If voltage at A4E208 is not within tolerance, check voltage at A4E209. Voltage should be +4.3 V dc to +5.3 V dc.

e. If voltage at A4E208 is within tolerance, use voltages and waveforms on Figure 4-1 to isolate fault on assembly A4.

2.6.4 Focus Defective (2.4.1-h.)

a. Check voltage at V1-5. Voltage should vary over at least a 100 volt span within −650 V dc and −920 V dc as FOCUS control, R21, is rotated throughout its range.

b. If voltage is within tolerance, change V1.

c. If voltage is not within tolerance, check for −1000 V dc ±10% at A2E417.

d. If voltage is within tolerance at A2E417, check wiring and neon indicator, DS1.

e. If voltage at A2E417 is out of tolerance, use Figure 4-1 voltages and waveforms to isolate fault on assembly A2.

2.6.5 Intensity Defective (2.4.1-h.)

NOTE

The Model ODM-1 operates in Mainframes designed for 12 V dc operation. The normal maximum intensity is not as high as that of oscilloscopes designed for 115 V ac operation because a lower power CRT is used to conserve current drain during battery operation.

a. Check voltage at V1-3 and check that voltage varies over a 50 volt span within the range of −850 V dc to −1100 V dc as INTENSITY control, R18, is rotated throughout its range.

b. If voltage is within tolerance, replace, V1.

c. If voltage is out of tolerance, check voltage at A2E417.

d. If voltage is within tolerance at A2E417, check associated wiring and INTENSITY control, R18.

e. If voltage at A2E417 is out of tolerance, use Figure 4-1 voltages and waveforms to isolate fault in assembly, A2.

2.6.6 Vertical Center Control Defective (2.4.2-b.)

Perform procedures of Paragraph 2.6.2.

2.6.7 Horizontal Center Control Defective (2.4.2-e.)

Perform procedures of Paragraph 2.6.3.

2.6.8 Sweep Speed Cannot Adjust Below 50 Hz on Low Range (2.4.3-h.)

a. Check resistance of A4E203 to ground. If resistance is greater than 10 ohms, check wiring of SWEEP RANGE switch, S4.

b. If A4E203 is grounded, check voltage at A4E202 to determine if voltage varies over a span of at least 0.6 V dc within the range of +7.4 V dc to +9.9 V dc.

c. If voltage is within tolerance, use voltages and waveforms on Figure 4-1 to isolate fault on assembly, A4.

2.6.9 Sweep Speed Cannot Adjust Above 5000 Hz on High Range (2.4.3-l.)

a. Check resistance of A4E203 to ground. If resistance is less than 100 kilohms, check wiring of SWEEP RANGE switch, S4.

b. If resistance is greater than 100 kilohms, check voltage at A4E202 to determine if voltage varies over a span of at least 0.6 V dc within the range of +7.4 V dc to +9.9 V dc.

2.6.10 Sweep Speed Cannot Adjust Below 500 Hz on High Range (2.4.3-o.)

Perform procedures of Paragraph 2.6.9.

2.6.11 Sweep Speed Cannot Adjust Above 500 Hz on Low Range (2.4.3-s.)

Perform procedures of Paragraph 2.6.8.

2.6.12 External Vertical Input Sensitivity Not Within Specification (2.4.4-d.)

a. Apply a 1 kHz signal with a level of 25 mV rms to EXT VERT receptacle and check voltage with oscilloscope at A3E101. Voltage should be 70 mV p-p.

b. If voltage is not 70 mV p-p, check VERT GAIN control, R7, R6 and associated wiring.

c. If voltage is 70 mV p-p, use voltages and waveforms on Figure 4-1 to isolate fault.

2.6.13 Vertical Amplifier Frequency Response Not Within Specification (2.4.5-d.)

a. Check voltage at A3E101. Verify that voltage changes less than 1 dB from 50 Hz to 30 kHz.

b. If voltage changes more than 1 dB over this range, check C1, R6, R7 (VERT GAIN), S1 and associated wiring.

c. If voltage does not vary more than 1 dB, use voltages and waveforms of Figure 4-1 to isolate fault on assembly A3.

2.6.14 Operate Indicator Sensitivity Not Within Specification (2.4.6-h.)

a. Connect ac voltmeter to A1E501 and ground. Verify that 2 MHz level is 2.5 mV rms ±10%.

b. If level is not 2.5 mV rms ±10% at A1E501, the fault is in the Mainframe. Refer to Mainframe Maintenance Manual.

c. If level is 2.5 mV ±10% at A1E501, use Figure 4-1 voltages and waveforms to isolate fault on assembly, A1.

2.6.15 Overload Indicator Sensitivity Not Within Specification (2.4.6-i.)

a. Connect ac voltmeter to A1E501 and ground. Verify that 2 MHz level is 25 mV rms ±10%.

b. If level is not 25 mV rms ±10% at A1E501, the fault is in the Mainframe. Refer to Mainframe Maintenance Manual.

c. If level is 25 mV rms ±10% at A1E501, use Figure 4-1 voltages and waveforms to isolate fault on assembly, A1.

2.6.16 5 kHz Range Gain Not Within Specification (2.4.7-h.)

a. Connect dc digital voltmeter to A1E507 and ground. Verify that voltage is +233 mV dc ±20 mV.

b. If voltage is not +233 mV dc ±20 mV at A1E507, use Figure 4-1 voltages and waveforms to isolate fault on assembly, A1.

c. If voltage at A1E507 is correct, check voltage on A3E101. Verify that voltage is +233 mV dc ±20 mV.

d. If voltage at A3E101 is correct, use Figure 4-1 voltages and waveforms to isolate fault on vertical amplifier assembly, A3.

e. If voltage is not +233 mV dc ±20 mV at A3E101, check DEV RANGE switch S2, R2, R3, R4 and associated wiring.

2.6.17 15 kHz Range Gain Not Within Specification (2.4.7-l.)

Repeat procedures of Paragraph 2.6.16 except that voltage at A1E507 and A3E101 should be −400 mV dc ±40 mV.

2.6.18 Insufficient Vertical Amplitude at 15 kHz (2.4.8-d.)

a. Connect ac voltmeter to A3E114 and ground. Verify that voltage is 480 mV rms minimum.

b. If voltage at A3E114 is greater than 480 mV rms, the fault is in the Mainframe. Refer to Mainframe Maintenance Manual.

c. If voltage at A3E114 is less than 480 mV rms, check voltage between A3E116 and ground. Verify that voltage is 113 mV rms minimum.

d. If voltage at A3E116 is greater than 113 mV rms connect audio oscillator to EXT MOD/HORIZ IN receptacle, set MOD MODE switch to EXT, set oscillator to 400 mV rms and adjust A3R129 for a 400 mV rms indication at A3E114.

e. If unable to obtain correct voltage at A3E114, use Figure 4-1 voltages and waveforms to isolate fault in A3U102 circuit

f. If voltage at A3E116 is not correct, check R14, R15, R16 and MOD MODE switch, S4, wiring. Verify that voltage at A1E513 is 321 mV rms ±10%.

g. If voltage at A1E513 is not correct, check INT MOD/AUDIO OUT control, R13, and associated wiring. Verify that voltage at A1E512 is 640 mV rms ±10%.

h. If voltage at A1E512 is not correct, use Figure 4-1 voltages and waveforms to isolate fault in modulation oscillator on assembly, A1.

2.6.19 Insufficient Vertical Amplitude at 5 kHz in External Mode (2.4.9-g.)

a. Connect ac voltmeter to EXT MOD/HORIZ IN receptacle. Verify that voltage is 80 mV rms ±20%.

b. If voltage is not correct, vary audio oscillator output level to obtain this level.

c. If voltage is correct, verify that voltage at A3E114 is 500 mV rms ±5%.

d. If voltage at A3E114 is correct, the fault is in the Mainframe. Refer to Mainframe Maintenance Manual.

e. If voltage is not correct at A3E114, perform Steps 2.6.18-d. and 2.6.18e.

2.6.20 External Horizontal Sensitivity Not Within Specification (2.4.10-c.)

a. Set audio oscillator at 500 mV rms and measure voltage at A4E206.

b. If voltage at A4E206 is less than 500 mV rms, check S4 and associated wiring.

c. If voltage at A4E206 is 500 mV rms, use Figure 4-1 voltages to isolate fault on assembly, A4.

2.6.21 Audio Output Frequency Not Within Specification (2.4.11-e.)

Use Figure 4-1 voltages and waveforms to isolate fault on assembly, A1.

2.6.22 Audio Output Level Not Within Specification (2.4.11-e.)

a. Check the level at A1E513. This level should be greater than 1.2 V p-p. If it is, the fault is in stages A1Q519 and A1Q520. Use Schematic Diagram voltages, Figure 4-1, to isolate the fault.

b. If the level at A1E513 is within tolerance, check the level at A1E512. If the level at A1E512 differs from the level at A1E513 check R13, R14, R15, R16, S4 and associated wiring.

c. If the level at A1E512 is equal to the level at A1E513 and is less than 1.2 V p-p, use the voltage and waveform information on the Schematic Diagram Figure 4-1, to isolate the fault on assembly, A1.

2.6.23 Audio Distortion Not Within Specification (2.4.11-g.)

a. Connect distortion analyzer to A1E512 and calibrate it at 1.0 kHz. Distortion should be 0.5% or less.

b. If distortion at A1E512 is greater than 0.5%, use Figure 4-1 voltages and waveforms to isolate fault on assembly, A1.

c. If distortion at A1E512 is less than 0.5% the fault is in stages A1Q519 and A1Q520. Use Figure 4-1 voltages and waveforms to isolate the fault.

Section III
REPLACEABLE PARTS

3.1 INTRODUCTION

This section contains information for ordering replacement parts. Tables 3-1 thru 3-5 list the parts according to their functional groupings. Parts are listed in alpha-numerical order of their reference designators and indicate the description, the Singer part number, typical manufacturer of the part in a five-digit code, and the manufacturer's part number. Table 3-6 lists the typical manufacturers in numerical code number order.

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Table 3-1. Parts List for Main Assemblies and Chassis

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
A1	Assembly, IF	5-003178-005	88869	
A2	Assembly, High Voltage Power Supply	4-003202-005	88869	
A3	Assembly, Vertical Amplifier	4-003204-008	88869	
A4	Assembly, Horizontal Amplifier	5-003217-005	88869	
C1	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C2	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 V dc	1-900001-021	73445	C280AE,0.47uF
C3	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 250 V dc	1-900012-012	56289	5GA-S20
C4	Not used			
C5	Not used			
C6	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
DS1	Lamp, indicator, 10 V, 20 mA	1-925007-005	32539	L10/20
DS2	Lamp, indicator, 10 V, 20 mA	1-925007-005	32539	L10/20
DS3	Lamp, indicator, neon	1-925008-001	24446	NE89
J1	Connector, jack, phone	1-910043-001	11636	KC19-68
J2	Connector, jack, phone	1-910152-001	82389	S13B
J3	Connector, jack, BNC	1-910043-001	11636	KC19-68
J4	Connector, jack, BNC	1-910043-001	11636	KC19-68
P1	Connector, plug, rectangular, 16 pins	1-910071-001	02660	26-159-16
Q1	Transistor, silicon, NPN	1-958001-004	04713	MJE521
Q2	Transistor, silicon, NPN	1-958001-004	04713	MJE521
R1	Not used			
R2	Resistor, fixed, film, 70 kilohm, ±1%, 1/8 W	1-945016-580		RN60D7002F
R3	Resistor, fixed, film, 20 kilohm, ±1%, 1/8 W	1-945016-318		RN60D2002F
R4	Resistor, fixed, film, 10 kilohm, ±1%, 1/8 W	1-945016-289		RN60D1002F
R5	Not used			
R6	Resistor, fixed, composition, 220 ohm, ±10%, 1/4 W	1-945000-029	01121	CB2211
R7	Resistor, variable, composition, 25 kilohm, ±20%, 1/3 W (part of S1)			
R8	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R9/R18	Resistor, variable, assembly (R9) resistor, variable, composition, 1.0 kilohm, ±30%, 1/2 W	1-003215-002	88869	
R10	Not used			
R11	Resistor, variable, composition, 500 kilohm, ±30%, 1/4 W (part of S3)			

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R12/R21	Resistor, variable assembly, (R12) resistor, variable, composition, 5 kilohm, ±30%, 1/2 W	1-003215-001	88869	
R13	Resistor, variable, composition, 1.0 kilohm, ±20%, 1/2 W (part of S5)			
R14	Resistor, fixed, composition, 1.8 kilohm, ±10%, 1/4 W	1-945000-040	01121	CB1821
R15	Resistor, fixed, composition, 4.7 kilohm, ±10%, 1/4 W	1-945000-045	01121	CB4721
R16	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R17	Not used			
R18	Resistor, variable, composition, 1.0 megohm, ±30%, 1/4 W (part of R9/R18)			
R19	Resistor, fixed, composition, 470 kilohm, ±10%, 1/4 W	1-945000-069	01121	CB4741
R20	Resistor, fixed, composition, 560 kilohm, ±5%, 1/2 W	1-945001-228	01121	EB5645
R21	Resistor, variable, composition, 500 kilohm, ±30%, 1/4 W (part of R12/R21)			
R22	Resistor, fixed, composition, 4.7 megohm, ±5%, 2 W	1-945003-081	01121	HB4755
R23	Not used			
R24	Not used			
R25	Not used			
R26	Not used			
R27	Not used			
R28	Not used			
R29	Not used			
R30	Resistor, fixed, composition, 6.8 kilohm, ±5%, 1/4 W	1-945000-182	01121	CB6825
R31	Resistor, fixed, composition, 68 kilohm, ±5%, 1/4 W	1-945000-206	01121	CB6835
R32	Resistor, variable, composition, 200 ohm, ±10%, 1/4 W (part of S4/R32)			
R33	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
S1/R7	Switch/Variable resistor assembly, (S1) switch, rotary, 2 poles, 2 positions	1-003210-001	88869	
S2/S6	Switch/Concentric assembly, (S2) switch, rotary, 1 pole, 3 positions	1-403529-001	88869	
S3/R11	Switch/Variable resistor assembly, (S3) switch, rotary, 1 pole, 2 positions	1-003210-002	88869	
S4/R32	Switch/Variable resistor assembly, (S4) switch, rotary, 3 poles, 3 positions	1-403707-001	88869	
S5/R13	Switch/Variable resistor assembly, (S5) switch, rotary, 1 pole, 2 positions	2-402816-001	88869	

Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
S6	Switch, rotary, 1 pole, 2 positions (part of S2/S6)			
V1	Electron tube, cathode ray	1-917000-001	24972	D7-166J
XV1	Socket, CRT	1-950003-001	24972	30232

Table 3-2. Parts List for IF Assembly, A1

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C501	Capacitor, fixed, mica, 1200 pF, ±5%, 100 V dc	1-900003-057	72136	DM15F122J
C502	Capacitor, fixed, mica, 1200 pF, ±5%, 100 V dc	1-900003-057	72136	DM15F122J
C503	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900003-034	72136	DM15F151J
C504	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C505	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900003-034	72136	DM15J151J
C506	Not used			
C507	Capacitor, fixed, mica, 5 pF, ±10%, 500 V dc	1-900003-004	72136	CM15C050K
C508	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900003-034	72136	DM15F151J
C509	Capacitor, fixed, mica, 1200 pF, ±5%, 100 V dc	1-900003-057	72136	DM15F122J
C510	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C511	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C512	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900003-034	72136	DM15F151J
C513	Capacitor, fixed, mica, 47 pF, ±5%, 500 V dc	1-900003-021	72136	DM15E470J
C514	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C515	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C516	Capacitor, fixed, electrolytic, 25 uF, +75% −10%, 25 V dc	1-900039-001	72699	984-2203
C517	Capacitor, fixed, ceramic, 0.005 uF, +80% −20%, 500 V dc	1-900012-004	72982	801Z5U502Z
C518	Capacitor, fixed, ceramic, 0.001 uF, +100% −0%, 500 V dc	1-900012-002	72982	861Z5U102P
C519	Not used			
C520	Not used			
C521	Capacitor, fixed, plastic, 150 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C522	Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc	1-900002-034	72136	DM15F151J
C523	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C524	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C525	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C526	Capacitor, fixed, electrolytic, 25 uF, +75% −10%, 25 V dc	1-900039-001	72699	984-2203

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C527	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C528	Not used			
C529	Not used			
C530	Not used			
C531	Not used			
C532	Not used			
C533	Not used			
C534	Not used			
C535	Not used			
C536	Not used			
C537	Not used			
C538	Not used			
C539	Not used			
C540	Not used			
C541	Not used			
C542	Not used			
C543	Not used			
C544	Not used			
C545	Not used			
C546	Not used			
C547	Not used			
C548	Not used			
C549	Not used			
C550	Not used			
C551	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C552	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C553	Capacitor, fixed, electrolytic, 25 uF, +75% −10%, 25 V dc	1-900039-001	72699	984-2203
C554	Not used			
C555	Not used			
C556	Not used			
C557	Not used			
C558	Not used			
C559	Not used			
C560	Not used			
C561	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C562	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C563	Capacitor, fixed, mica, 100 pF, ±5%, 500 V dc	1-900003-030	72136	DM15F101J
C564	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C565	Capacitor, fixed, electrolytic, 200 uF, +75% –10%, 15 V dc	1-900039-002	72699	984-1733
C566	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C567	Capacitor, fixed, electrolytic, 2 uF, +75 –10%, 25 V dc	1-900023-016	56289	TE1201
C568	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C569	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C570	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C571	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C572	Not used			
C573	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
CR501	Not used			
CR502	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
CR503	Diode, silicon, Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
CR504	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
CR505	Diode, germanium, Vr=30 V, If=100 mA	1-913005-001	03877	1N273
L501	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	
L502	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	
L503	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	
L504	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	
L505	Not used			
L506	Inductor, variable, 30 uH to 60 uH	1-906006-003	88869	
Q501	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q502	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q503	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q504	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q505	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q506	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
Q507	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q508	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q509	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q510	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q511	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q512	Transistor, N-channel, J-FET	1-958031-003	17856	E102
Q513	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q514	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q515	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q516	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q517	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q518	Transistor, N-channel, J-FET	1-958044-003	04713	MFE2006
Q519	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q520	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R501	Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601
R502	Resistor, fixed, composition, 6.8 kilohm, ±10%, 1/4 W	1-945000-047	01121	CB6831
R503	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R504	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R505	Resistor, fixed, composition, 100 kilohm, ±10%, 1/4 W	1-945000-061	01121	CB1041
R506	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R507	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R508	Resistor, fixed, composition, 100 kilohm, ±10%, 1/4 W	1-945000-061	01121	CB1041
R509	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R510	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R511	Resistor, fixed, composition, selected, 9.1 kilohm nominal, ±5%, 1/4 W	1-945000-185	01121	CB9125
R512	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R513	Resistor, fixed, composition, 12 kilohm, ±10%, 1/4 W	1-945000-050	01121	CB1231
R514	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R515	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R516	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945007-004	71450	X201

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R517	Resistor, fixed, composition, selected, 3.9 kilohm nominal, ±5%, 1/4 W	1-945000-176	01121	CB3925
R518	Not used			
R519	Not used			
R520	Not used			
R521	Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711
R522	Resistor, fixed, composition, 120 ohm, ±10%, 1/4 W	1-945000-026	01121	CB1211
R523	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R524	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R525	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R526	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R527	Resistor, variable, wirewound, 1.0 kilohm, ±10%, 1/4 W	1-945056-007	80294	3257W1-102
R528	Resistor, variable, wirewound, 1.0 kilohm, ±10%, 1/4 W	1-945056-007	80294	3257W1-102
R529	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R530	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R531	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R532	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R533	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R534	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R535	Resistor, fixed, composition, 2.7 kilohm, ±10%, 1/4 W	1-945000-042	01121	CB2721
R536	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R547	Not used			
R548	Not used			
R549	Not used			
R550	Not used			
R551	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R552	Resistor, fixed, composition, 2.7 kilohm, ±10%, 1/4	1-945000-042	01121	CB2721
R553	Resistor, fixed, composition, 10 megohm, ±10%, 1/4 W	1-045000-085	01121	CB1061

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R554	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R555	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R556	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R557	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R558	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R559	Not used			
R560	Not used			
R561	Resistor, fixed, composition, selected, 15 kilohm nominal, ±10%, 1/4 W	1-945000-051	01121	CB1531
R562	Resistor, variable, composition, 5 kilohm, ±30%, 1/4 W	1-945007-006	71450	X201
R563	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R564	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R565	Resistor, fixed, composition, selected, 150 ohm nominal, ±10%, 1/4 W	1-945000-027	01121	CB1511
R566	Resistor, variable, composition, 100 ohm, ±30%, 1/4 W	1-945007-001	71450	X201
R567	Resistor, fixed, composition, 39 ohm, ±5%, 1/4 W	1-945000-128	01121	CB3905
R568	Thermistor, 300 ohm, ±2%	1-945070-001	14674	C20
R569	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R570	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R571	Resistor, fixed, composition, 47 kilohm, ±10%, 1/4 W	1-945000-057	01121	CB4721
R572	Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601
R573	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R574	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R575	Resistor, fixed, composition, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811
R576	Not used			
R577	Resistor, fixed, composition, 820 ohm, ±5%, 1/4 W	1-945000-160	01121	CB8215
R578	Resistor, fixed, composition, 2.4 kilohm, ±5%, 1/4 W	1-945000-171	01121	CB2425

Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R579	Resistor, fixed, composition, 820 ohm, ±5%, 1/4 W	1-945000-160	01121	CB8215
R580	Resistor, fixed, composition, 100 ohm, ±5%, 1/4 W	1-945000-138	01121	CB1015
R581	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R582	Resistor, fixed, composition, 6.2 kilohm, ±10%, 1/4 W	1-945000-181	01121	CB6221
R583	Resistor, fixed, composition, 330 ohm, ±10%, 1/4 W	1-945000-031	01121	CB3311
R584	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611
R585	Not used			
R586	Not used			
R587	Resistor, fixed, composition, 33 ohm, ±10%, 1/4 W	1-945000-019	01121	CB3301
R588	Resistor, fixed, composition, 1.5 kilohm, ±5%, 1/4 W	1-945000-166	01121	CB1525
U501	Integrated circuit, FM detector and limiter	1-926031-001	56289	ULN2111A

Table 3-3. Parts List for High Voltage Power Supply Assembly, A2

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C401	Capacitor, fixed, plastic, 0.047 uF, ±20%, 250 V dc	1-900001-009	73445	C280AE,0.047uF
C402	Capacitor, fixed, electrolytic, 200 uF, +75% –10%, 15 V dc	1-900039-002	72699	984-1733
C403	Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 V dc	1-900001-021	73445	C280AE,0.47uF
C404	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 V dc	1-900012-012	56289	5GA520
C405	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 V dc	1-900012-012	56289	5GA520
C406	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 V dc	1-900012-012	56289	5GA520
C407	Capacitor, fixed, electrolytic, 4 uF, +100% –10%, 350 V dc	1-900011-001	14665	BR4-350
C408	Capacitor, fixed, electrolytic, 4 uF, +100% –10%, 350 V dc	1-900011-001	14665	BR4-350
C409	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-004	72699	984-1653
C410	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-004	72699	984-1653
C411	Capacitor, fixed, plastic, 0.1 uF, ±10%, 250 V dc	1-900001-113	73445	C280AE,0.1uF
C412	Capacitor, fixed, ceramic, 0.02 uF, ±20%, 1000 V dc	1-900012-012	56289	5GA520
CR401	Diode, silicon, Vr=2000 V, If=50 mA	1-913087-001	83003	VG2X
CR402	Diode, silicon, Vr=2000 V, If=50 mA	1-913087-001	83003	VG2X
CR403	Diode, silicon, Vr=400 V, If =1 A	1-913088-002	04713	1N4936
CR404	Diode, silicon, Vr=400 V, If=1 A	1-913088-002	04713	1N4936
CR405	Diode, silicon, Vr=50 V, If=1 A	1-913088-001	04713	1N4933
CR406	Diode, silicon, Vr=50 V, If=1 A	1-913088-001	04713	1N4933
CR407	Diode, silicon, zener, 15 V, ±10%, 1 W	1-913004-017	04713	MZ1000-17
L401	Inductor, fixed, 20 uH minimum	1-003213-001	88869	
R401	Resistor, fixed, composition, 68 ohm, ±10%, 1/4 W	1-945000-023	01121	CB6801
R402	Resistor, fixed, composition, 680 ohm, ±10%, 1/4 W	1-945000-035	01121	CB6811
R403	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R404	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
T401	Transformer, power	1-003206-001	88869	

Table 3-4. Parts List for Vertical Amplifier Assembly, A3

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C101	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C102	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
C103	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C104	Capacitor, fixed, ceramic, 0.001 uF, +100% –0%, 500 V dc	1-900012-002	72982	861Z50102P
C105	Capacitor, fixed, plastic, 0.1 uF, ±10%, 400 V dc	1-900005-115	90201	PVC401
C106	Capacitor, fixed, ceramic, 0.001 uF, +100% –0%, 500 V dc	1-900012-002	72982	861Z50102P
C107	Capacitor, fixed, electrolytic, 100 uF, +75% –10%, 25 V dc	1-900039-004	72699	984-1653
C108	Not used			
C109	Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 35 V dc	1-900057-146	56289	150D105X0035A2
C110	Not used			
C111	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
CR101	Not used			
CR102	Not used			
CR103	Diode, silicon Vr=75 V, If=10 mA	1-913007-001	24446	1N4148
Q101	Transistor, N-channel, J-FET	1-958002-002	04713	2N5458
Q102	Transistor, N-channel, J-FET	1-958002-002	04713	2N5458
Q103	Transistor, silicon, NPN	1-958004-001	02735	40327
Q104	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q105	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
R101	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R102	Resistor, fixed, composition, 10 megohm, ±10%, 1/4 W	1-945000-085	01121	CB1061
R103	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R104	Resistor, fixed, composition, 2.2 megohm, ±10%, 1/4 W	1-945000-077	01121	CB2251
R105	Resistor, variable, composition, 100 kilohm, ±30%, 1/4 W	1-945010-010	71450	U201
R106	Resistor, fixed, composition, 1.5 kilohm, ±10%, 1/4 W	1-945000-039	01121	CB1521
R107	Resistor, fixed, composition, 1.0 kilohm, ±10% 1/4 W	1-945000-037	01121	CB1021
R108	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R109	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711

Table 3-4. Parts List for Vertical Amplifier Assembly, A3 (Cont.)

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R110	Resistor, fixed, composition, 1 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051
R111	Resistor, fixed, composition, selected, 10 ohm nominal, ±10%, 1/4 W	1-945000-013	01121	CB1001
R112	Resistor, variable, composition, 5 kilohm, ±30%, 1/4 W	1-945010-006	71450	U201
R113	Resistor, fixed, composition, 47 kilohm, ±10%, 1 W	1-945002-057	01121	GB4731
R114	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1021
R115	Resistor, fixed, composition, 47 kilohms, ±10%, 1 W	1-945002-057	01121	GB4731
R116	Resistor, fixed, composition, 1 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051
R117	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211
R118	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R119	Resistor, fixed, composition, selected, 1.5 kilohm nominal, ±10%, 1/4 W	1-945000-039	01121	CB1521
R120	Resistor, fixed, composition, 6.8 kilohm, ±5%, 1/4 W	1-945000-182	01121	CB6825
R121	Resistor, fixed, composition, 1.0 kilohm, ±5%, 1/4 W	1-945000-162	01121	CB1025
R122	Resistor, fixed, composition, 150 ohm, ±5%, 1/4 W	1-945000-142	01121	CB1515
R123	Resistor, fixed, composition, 150 ohm, ±5%, 1/4 W	1-945000-142	01121	CB1515
R124	Resistor, fixed, composition, 1.0 kilohm, ±5%, 1/4 W	1-945000-162	01121	CB1025
R125	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R126	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R127	Resistor, fixed, composition, 1 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051
R128	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R129	Resistor, variable, composition, 10 kilohm, ±30%, 1/4 W	1-945010-007	71450	U201
R130	Resistor, fixed, composition, 180 ohms, ±10%, 1/4 W	1-945000-028	01121	CB1811
U101	Integrated circuit, differential/cascode amplifier	1-926005-001	02735	CA3028A
U102	Integrated circuit, amplifier	1-004763-001	88869	

Table 3-5. Parts List for Horizontal Amplifier Assembly, A4

Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
C200	Capacitor, fixed, plastic, 0.0022 uF, ±10%, 500 V dc	1-900005-101	90201	PVC6222
C201	Capacitor, fixed, plastic, 0.022 uF, ±10%, 200 V dc	1-900005-004	90201	PVC2122
C202	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF
C203	Not used			
C204	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
C205	Capacitor, fixed, electrolytic, 25 uF, +75% –10%, 25 V dc	1-900039-001	72699	984-2203
Q200	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q201	Transistor, silicon, PNP	1-958000-002	04713	2N3906-5
Q202	Transistor, silicon, NPN	1-958000-001	04713	2N3904-5
Q203	Transistor, N-channel, J-FET	1-958002-002	04713	2N5458
Q204	Transistor, silicon, NPN	1-958004-001	02735	40327
Q205	Transistor, silicon, NPN	1-958004-001	02735	40327
R200	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R201	Resistor, fixed, composition, 15 kilohm, ±10%, 1/4 W	1-945000-051	01121	CB1531
R202	Resistor, variable, composition, 100 kilohm, ±30%, 1/4 W	1-945010-010	71450	U201
R203	Resistor, fixed, composition, 1.2 kilohm, ±10%, 1/4 W	1-945000-038	01121	CB1221
R204	Resistor, variable, composition, 10 kilohm, ±30%, 1/4 W	1-945010-007	71450	U201
R205	Resistor, fixed, composition, 10 megohm, ±10%, 1/4 W	1-945000-085	01121	CB1061
R206	Not used			
R207	Not used			
R208	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R209	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R210	Resistor, fixed, composition, 47 kilohm, ±10%, 1 W	1-945002-057	01121	GB4731
R211	Resistor, fixed, composition, 5.6 kilohm, ±10%, 1/4 W	1-945000-046	01121	CB5621
R212	Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011
R213	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945010-004	71450	U201
R214	Resistor, fixed, composition, 47 kilohm, ±10%, 1 W	1-945002-057	01121	GB4731
R215	Resistor, fixed, composition, 5.6 kilohm, ±10%, 1/4 W	1-945000-046	01121	CB5621

Table 3-5. Parts List for Horizontal Amplifier Assembly, A4 (Cont.)

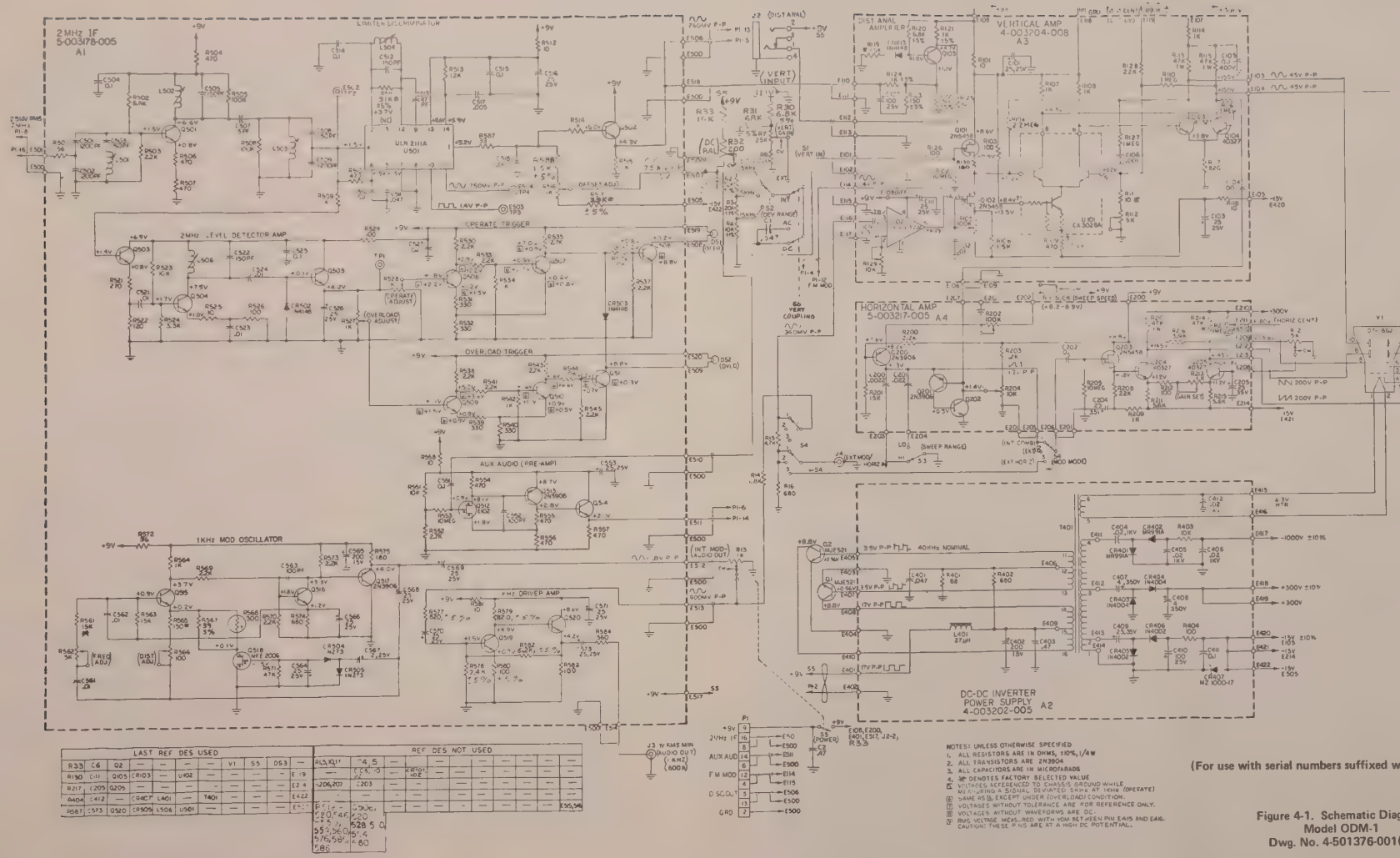
Ref. Desig.	Description	Singer Part No.	Mfr. Code No.	Mfr. Part No.
R216	Resistor, fixed, composition, 3.9 kilohm, ±10%, 1/4 W	1-945000-044	01121	CB3921
R217	Resistor, variable, composition, 1 megohm, ±30%, 1/4 W	1-945010-013	71450	U201

Table 3-6. Code List of Manufacturers

The following code numbers are from the Federal Supply Code for Manufacturers Cataloging Handbook H4-2.

Code No.	Manufacturer	Address
01121	Allen-Bradley Co.	Milwaukee, Wis.
02660	Amphenol-Bunker Ramo Corp., Connector Div.	Broadview, Ill.
02735	RCA Semiconductor and Materials Div.	Sommerville, N.J.
03877	Transitron Electronic Corp.	Wakefield, Mass.
04713	Motorola Inc.	Phoenix, Ariz.
11636	Kings Electronics Co.	Pasadena, Calif.
12954	Dickson Electronics Corp.	Scottsdale, Ariz.
14655	Cornell-Dubilier Elect. Corp.	Newark, N.J.
14674	Corning Glass Works, Electronic Components Dept.	Corning, N.Y.
17856	Siliconix, Inc.	Santa Clara, Calif.
24446	G. E. Corp.	Schenectady, N.Y.
24972	Telefunken Sales Corp.	Long Island, N.Y.
32539	Mura Corp.	Great Neck, N.Y.
56289	Sprague Electric Co.	North Adams, Mass.
71450	CTS Corp.	Elkhart, Ind.
72136	Electro Motive Mfg. Co.	Willimantic, Conn.
72699	General Instrument Corp.	Newark, N.J.
72982	Erie Technological Products Inc.	Erie, Pa.
73445	Amperex Electronics Co.	Hicksville, N.Y.
80294	Bourns Inc.	Riverside, Calif.
82389	Switchcraft Inc.	Chicago, Ill.
88869	Singer Instrumentation	Los Angeles, Calif.
90201	Mallory Capacitor Co.	Indianapolis, Ind.

Section IV
SCHEMATIC DIAGRAMS



LAST REF DES USED									REF DES NOT USED									
R33	C6	Q2	—	—	—	V1	S5	DS3	—	R133,101	—	C4,5	—	—	—	—	—	—
R130	C11	Q105	C103	—	U102	—	—	—	E19	—	—	C16,10	C101,102	—	—	—	—	—
R217	C205	Q205	—	—	—	—	—	—	E24	-206,207	—	C203	—	—	—	—	—	—
R404	C412	—	C407	L401	—	T401	—	—	E422	—	—	—	—	—	—	—	—	—
R587	C573	Q520	CR505	L506	U501	—	—	—	E517	—	—	—	—	—	—	—	—	E505,506

NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE IN OHMS, 10%, 1/4W
2. ALL TRANSISTORS ARE 2N3904
3. ALL CAPACITORS ARE IN MICROFARADS
4. ✱ DENOTES FACTORY SELECTED VALUE
5. VOLTAGES REFERENCED TO CHASSIS GROUND WHILE MEASURING A SIGNAL DEVIATED 50KHz AT 1KHz (OPERATE) SAME AS 5% EXCEPT UNDER (OVERLOAD) CONDITION.
6. VOLTAGES WITHOUT TOLERANCE ARE FOR REFERENCE ONLY.
7. VOLTAGES WITHOUT WAVEFORMS ARE DC.
8. RMS VOLTAGE MEAS. RED WITH VOM BETWEEN PIN E415 AND E416.
CAUTION: THESE PINS ARE AT A HIGH DC POTENTIAL.

Figure 4-1. Schematic Diagram, Model ODM-1 Dwg. No. 4-501376-001(C)

APPENDIX A
BACKDATING INFORMATION
For MODEL ODM-1

Serial Numbers 101 thru Instrument Serial Numbers Suffixed with 04295.

This manual refers directly to instrument serial numbers suffixed with 04296 and above. The following information is provided to adapt this manual for serial numbers 101 thru instrument serial numbers suffixed with 04295. Perform the following changes to the manual down to the effective serial number of your instrument.

Effective serial number: 101 thru serial numbers suffixed with 04295

Page 3-12: Table 3-3. Parts List For High Voltage Power Supply Assembly, A2

Change CR401, CR402, to:

Diode, silicon Vr=1050 V, If=250 mA	1-913043-002	04713	MR991A

Change CR403, CR404, to:

Diode, silicon Vr=400 V, If=1A	1-913001-004	04713	1N4004

Change CR405, CR406, to:

Diode, silicon Vr=100 V, If=1A	1-913001-002	04713	1N4002

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Change CR401, CR402 to: MR991A

Change CR403, CR404 to: 1N4004

Change CR405, CR406 to: 1N4002

Effective serial number: 101 thru serial numbers suffixed with 04288

Page 3-9: Table 3-2. Parts List For IF Assembly, A1

Change R517 to:

Resistor, fixed, composition, selected, 4.7 kilohm nominal, ±5%, 1/4 W	1-945000-178	01121	CB4725

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Change R517 to: 4.7 K ±5%

Effective serial numbers: 101 thru instrument serial numbers suffixed with 04226

Pages 3-10 and 3-11: Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Change R577 to:

Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211

Change R578 to:

Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031

Change R579 to:

Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711

Change R580 to:

Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Change R582 to:

Resistor, fixed, composition, 12 kilohm, ±10%, 1/4 W	1-945000-050	01121	CB1231

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Change R577 to: 820

Change R578 to: 10 K

Change R579 to: 470

Change R580 to: 100

Change R582 to: 12 K

Effective serial number: 101 thru serial numbers suffixed with 04134

Page 3-10: Table 3-2. Parts List For IF Assembly, A1

Change R567 to:

Resistor, fixed, composition, 56 ohm, ±10%, 1/4 W	1-945000-022	01121	CB5601

Change R572 to:

Resistor, fixed, composition, 100 ohm, ±10%, 1/4 W	1-945000-025	01121	CB1011

Change R575 to:

Resistor, fixed, composition, 270 ohm, ±10%, 1/4 W	1-945000-030	01121	CB2711

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Change R567 to: 56

Change R572 to: 100

Change R575 to: 270

Effective serial numbers: 101 thru 1335

Page 1-1: Paragraph 1.3.3 Vertical Deflection Circuitry

End of first sentence, Delete: "DC BAL potentiometer, R32." and replace it with "potentiometer, A1R516."

Page 1-3/1-4: Figure 1-1. Detailed Block Diagram, Model ODM-1

Delete: R32, DC BAL, C6, 0.01 and the +9 V reference.

Add: A line from A1E507 to the top of R2.

Page 2-7: Paragraph 2.5.6 Offset and Vertical Amplifier Gain Adjustment

Step a.: Change the word "controls" to "control" and delete the words "and DC BAL".

Page 3-2: Table 3-1. Parts List for Main Assemblies and Chassis

Delete:

C6	Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF

Page 3-3: Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Delete:

R32	Resistor, variable, composition, 200 ohms, ±10%, (part of S4/R32)			
R33	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031

Change S4/R32 from:

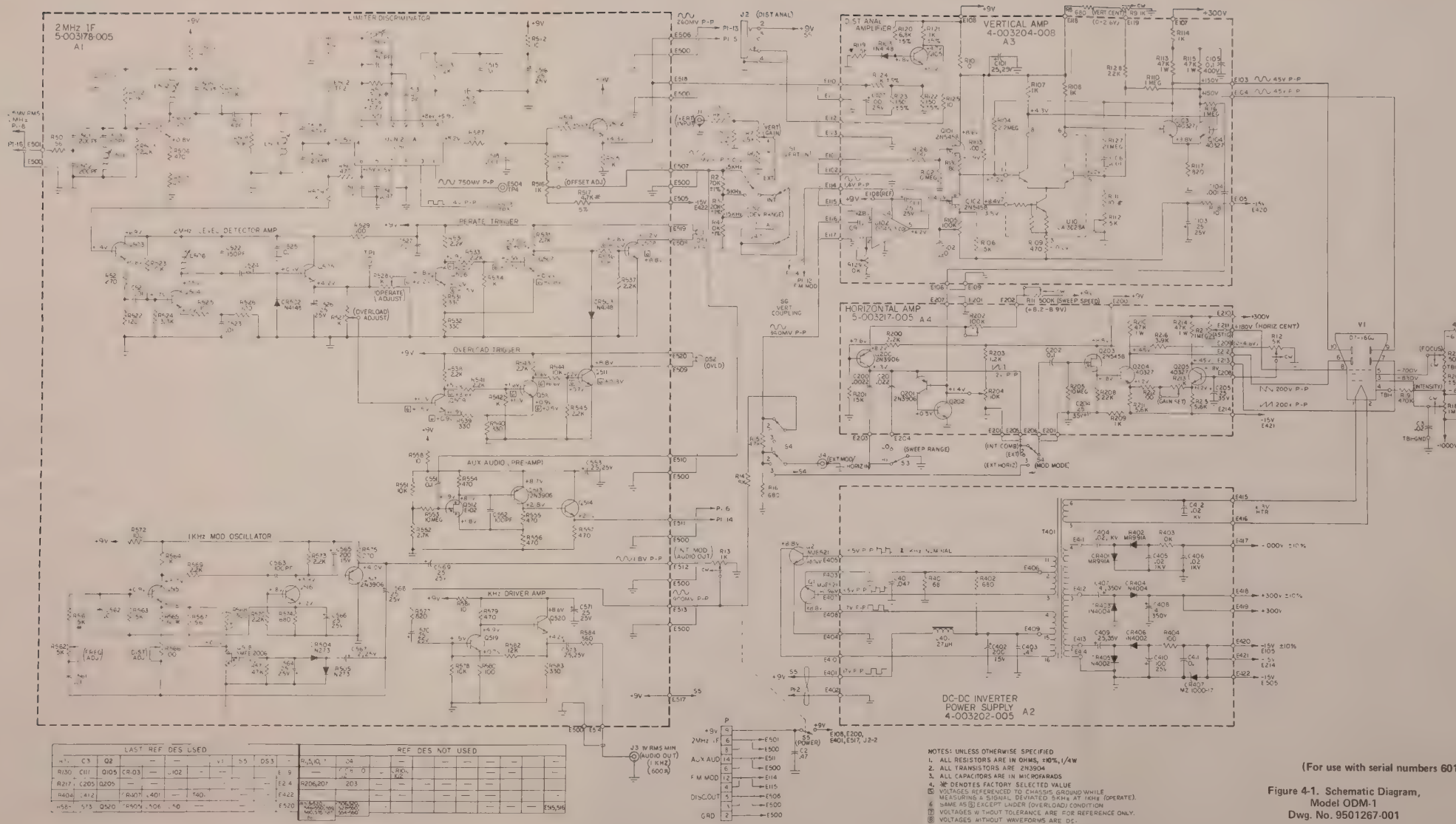
Switch/variable resistor assembly (S4) Switch, rotary, 3 poles, 3 positions	1-403707-001	88869	

To:

S4	Switch, rotary, 3 polies, 3 positions	1-003214-002	88869	

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Delete: Figure 4-1 and replace with the attached Figure 4-1.



(For use with serial numbers 601 thru 1335)

Figure 4-1. Schematic Diagram, Model ODM-1 Dwg. No. 9501267-001

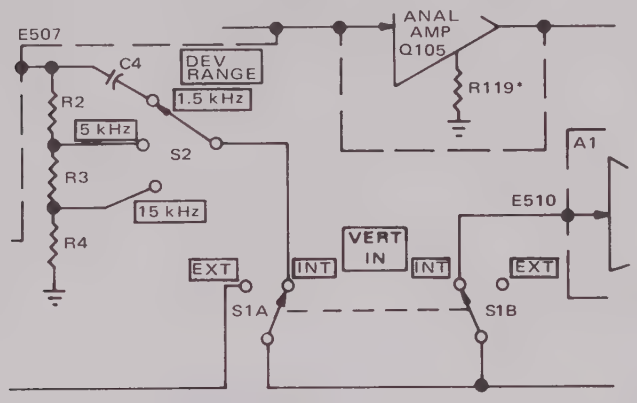
Effective serial numbers: 101 thru 1235

Page 1-1: Paragraph 1.3.3 Vertical Deflection Circuitry

Second paragraph, Delete: The entire last sentence.

Page 1-3/1-4: Figure 1-1. Detailed Block Diagram, Model ODM-1

Delete: S6, VERT COUPLING, and add S1B, VERT IN, as illustrated below.



Page 2-7: Paragraph 2.4.7 Evaluation of Deviation Indication Accuracy

Delete: Steps a. thru l. and replace with the following:

a. Set the Model ODM-1 controls as follows:

VERT IN	EXT
VERT GAIN	Fully cw
VERT CENTER	Trace on 0 center line

b. Connect the ac voltmeter and the audio oscillator to the VERT IN receptacle of the Model ODM-1.

c. Set the audio oscillator frequency to 1.0 kHz and output level for full-scale deflection on the CRT.

d. The ac voltmeter should indicate 25 mV rms ±10% (22.5 mV to 27.5 mV rms).

e. If the level required for full-scale deflection is less than 22.5 mV rms, increase the value of A1R511 from 9.1 kilohms to 10 kilohms. Disconnect the audio oscillator and repeat Steps 2.4.6-a. thru 2.4.6-d.

f. If the level required for full-scale deflection is more than 27.5 mV rms, decrease the value of A1R511 from 9.1 kilohms to 8.2 kilohms. Disconnect the audio oscillator and repeat Steps 2.4.6-a. thru 2.4.6-d.

Page 3-2, Table 3-1. Parts List for Main Assemblies and Chassis

Change C1 to:			
Capacitor, fixed, plastic, 0.47 uF, ±20%, 250 V dc	1-900001-021	73445	C280AE,0.47uF
Change C4 to:			
Capacitor, fixed, plastic, 0.01 uF, ±20%, 250 V dc	1-900001-001	73445	C280AE,0.01uF
Change C5 to:			
Capacitor, fixed, mica, 100 pF, ±5%, 100 V dc	1-900003-030	72136	DM15

Page 3-3: Table 3-1. Parts List for Main Assemblies and Chassis (Cont.)

Delete:

R30	Resistor, fixed, composition, 6.8 kilohm, ±5%, 1/4 W	1-945000-182	01121	CB6825

Delete:

R31	Resistor, fixed, composition, 68 kilohm, ±5%, 1/4 W	1-945000-206	01121	CB6835

Change S2/S6 from:

	Switch/Concentric assembly (S2) Switch, rotary, 1 pole, 3 positions	1-403529-001	88869	

To:

S2	Switch, rotary, 1 pole, 3 positions	1-003214-002	88869	

Delete: S6 and all information

Page 3-5: Table 3-2. Parts List for IF Assembly, A1

Change C519 to:

	Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-003	73445	C280AE,0.1uF

Page 3-7: Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Change CR501 to:

	Diode, silicon, zener, 4.7 V	1-913004-005	04713	JZ4.7B

Page 3-11: Table 3-2. Parts List for IF Assembly, A1 (Cont.)

Delete:

R588	Resistor, fixed, composition, 1.5 kilohm, ±5%, 1/4 W	1-945000-166	01121	CB1525

Page 3-13: Table 3-4. Parts List for Vertical Amplifier Assembly, A3

Change CR101, CR102 to:

	Diode, silicon	1-913007-001	24446	1N4148

Change R104 to:

	Resistor, fixed, composition, 1.0 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051

Change R106 to:

	Resistor, fixed, composition, 560 ohm, ±10%, 1/4 W	1-945000-034	01121	CB5611

Page 3-14: Table 3-4. Parts List for Vertical Amplifier Assembly, A3 (Cont.)

Delete:

R130	Resistor, fixed, composition, 180 ohm, ±10%, 1/4 W	1-945000-028	01121	CB1811

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Delete: Resistor R588, 1.5 K ±5%, and replace it with a zener diode, CR501 JZ4.7B 4.7 V, with the anode side to R516

Add: A capacitor, C516 0.1, in parallel with CR501 and with the curved side to the diode anode.

Change R517 to: 4.7K*

Delete: Resistor R30, 6.8 K ±5% and replace it with a capacitor, C1 0.47, with the curved side to J1.

Delete: Resistor R31, 68K.

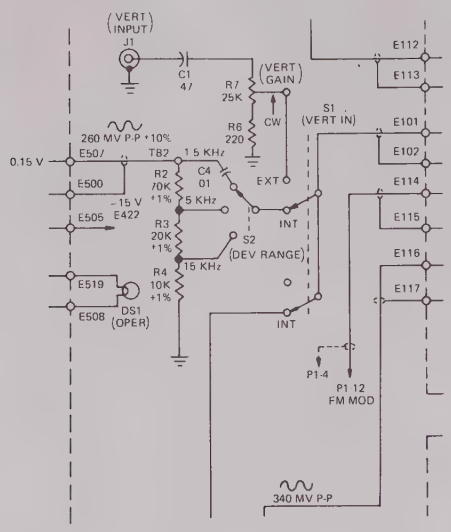
Delete: Resistor R130, 180, and replace with a diode, CR101, 1N4148, with the cathode to Q102.

Change R106 to 560.

Add: A diode, CR102, 1N4148, between R106 and Q102-S with the cathode to R106.

Change R104, to: 1M

Delete: Switch S6, VERT COUPLING, and add switch S1B, VERT IN, as illustrated below:



Add: Capacitor C5, 100 pF, between pins 9 and 10 of the CRT, with the curved side of the capacitor to pin 9.

Change E507 from: 0 V and 175 mV p-p ±10% To: 0.15 V and 260 mV p-p ±10%, respectively.

Effective serial numbers: 101 thru 1135

Page 3-12: Table 3-3. Parts List for High Voltage Power Supply Assembly, A2

Change C411 to:

Capacitor, fixed, ceramic, 0.1 uF, +80% –20%, 500 V dc	1-900012-005	56289	41C92

Page 3-13: Table 3-4. Parts List for Vertical Amplifier Assembly, A3

Change C109 to:

Capacitor, fixed, electrolytic, 1.0 uF, ±20%, 50 V dc	1-900115-003	12954	DIROGSA50M

Effective serial numbers: 101 thru 1000

Page 3-2: Table 3-1. Parts List for Main Assemblies and Chassis

Delete:

C5	Capacitor, fixed, mica, 100 pF, ±5%, 100 V dc	1-900003-030	72136	DM15

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Between pins 9 and 10 of the CRT, Delete: C5, 100 pF

Effective serial numbers: 101 thru 600

Page 3-2: Table 3-1. Parts List for Main Assemblies and Chassis

Change A3 part number, to: 5-003204-005

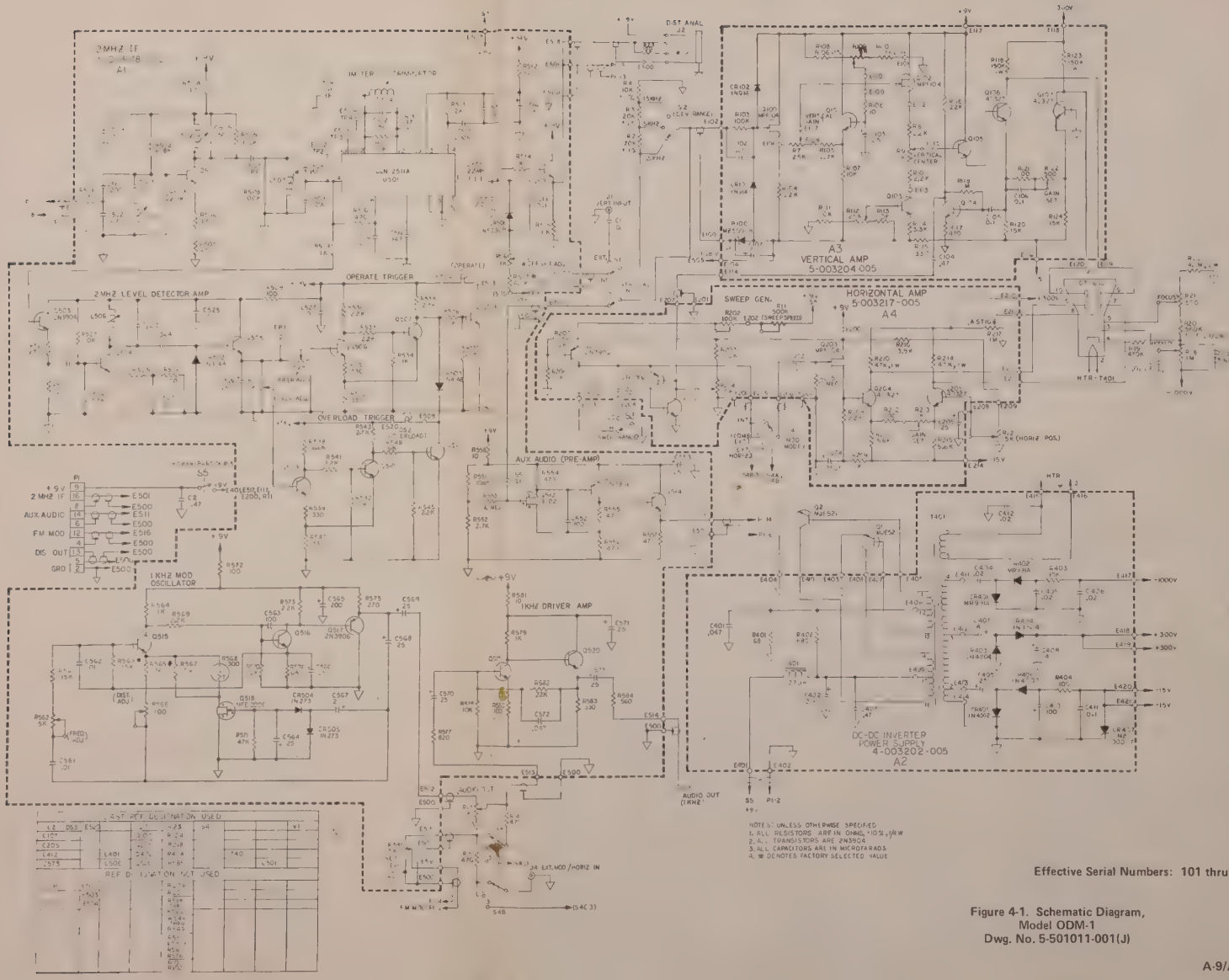
Change C1 to:

Capacitor, fixed, plastic, 0.1 uF, ±20%, 250 V dc	1-900001-013	73445	C280AE,0.1uF

Delete: C5, C6 and all information.

Change R6 to:

Resistor, fixed, composition, 1 kilohm, ±10%, 1/4 W	1-945000-029	01121	CB1021



Effective Serial Numbers: 101 thru 600

Figure 4-1. Schematic Diagram, Model ODM-1 Dwg. No. 5-501011-001(J)

R106	Resistor, fixed, composition, 10 ohm, ±10%, 1/4 W	1-945000-013	01121	CB1001
R107	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R108	Resistor, fixed, composition, 820 ohm, ±10%, 1/4 W	1-945000-036	01121	CB8211
R109	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945006-007	90201	MTC13L1
R110	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945005-007	90201	MTC13L4
R111	Resistor, fixed, composition, 2.2 kilohm, ±10%, 1/4 W	1-945000-041	01121	CB2221
R112	Resistor, variable, composition, 10 kilohm, ±30%, 1/4 W	1-945006-015	90201	MTC14L1
R113	Resistor, fixed, composition, 10 kilohm, ±10%, 1/4 W	1-945000-049	01121	CB1031
R114	Resistor, fixed, composition, 3.3 kilohm, ±10%, 1/4 W	1-945000-043	01121	CB3321
R115	Resistor, fixed, composition, 1.0 kilohm, ±10%, 1/4 W	1-945000-037	01121	CB1021
R116	Resistor, fixed, composition, 22 kilohm, ±10%, 1/4 W	1-945000-053	01121	CB2231
R117	Resistor, fixed, composition, 470 ohm, ±10%, 1/4 W	1-945000-033	01121	CB4711
R118	Resistor, fixed, composition, 1.0 megohm, ±10%, 1/4 W	1-945000-073	01121	CB1051
R119	Resistor, fixed, composition, 47 kilohm, ±10%, 1 W	1-945002-057	01121	GB4731
R120	Resistor, fixed, composition, 5.6 kilohm, ±10%, 1/4 W	1-945000-046	01121	CB5621
R121	Resistor, fixed, composition, 47 ohm, ±10%, 1/4 W	1-945000-021	01121	CB4701
R122	Resistor, variable, composition, 1.0 kilohm, ±30%, 1/4 W	1-945005-007	90201	MTC13L4
R123	Resistor, fixed, composition, 47 kilohm, ±10%, 1 W	1-945002-057	01121	GB4731
R124	Resistor, fixed, composition, 5.6 kilohm, ±10%, 1/4 W	1-945000-046	01121	CB5621

ADDENDUM
for
Manual No. 1-500783-299
Model No. ODM-1

ERRATA

Correct the following errors in the above manual:

Page 3-13: Table 3-4. Parts List for Vertical Amplifier Assembly, A3
Q103, Mfr. Part No., Was: 40327 Is: 40327-66031

Page 3-15: Table 3-5. Parts List for Horizontal Amplifier Assembly, A4
Q204, Q205, Mfr. Part No., Was: 40327 Is: 40327-66031

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1
CR401, CR402, Was: MR991A Is: VG2X
CR403, CR404, Was: 1N4004 Is: 1N4936
CR405, CR406, Was: 1N4002 Is: 1N4933

Page 3-5: Table 3-2. Parts List for IF Assembly, A1
C522, Singer Part No., Was: 1-900002-034 Is: 1-900003-034

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A	6/71	
	Revision	Initials
	Approved	9-30-75 Date

CLASS CODE

THE SINGER COMPANY
LOS ANGELES OPERATION
LOS ANGELES, CALIF.

TITLE ADDENDUM
Model ODM-1

DWG. NO.
1- 500783-299
SHEET 1.1

Initials

RUNNING CHANGES

Perform the following changes to the manual up to the serial number effectivity of your instrument:

Effective serial number: Serial numbers suffixed with 04350 and above

Page 3-13: Table 3-4. Parts List for Vertical Amplifier Assembly, A3

C104, Was: Capacitor, fixed, ceramic, 0.001 u F, + 100% - 0%, 500 Vdc — 1-900012-002 — 72982 — 861Z50102P

Is: Capacitor, fixed, ceramic, 0.002 u F, ± 10%, 500 Vdc — 1-900012-013 — 72982 — 871000X5F0202K

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

C104, Was: .001 Is: 0.002

Effective serial number: Serial numbers suffixed with 05150 and above

Page 3-14: Table 3-4. Parts List for Vertical Amplifier Assembly, A3 (Cont.)

R123, Was: Resistor, fixed, composition, 150 ohm, ± 5%, 1/4W — 1-945000-142 — 01121 — CB1515

Is: Resistor, fixed, composition, selected, 180 ohm nominal, ± 5%, 1/4W — 1-945000-144 — 01121 — CB1815

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

R123, Was: 150 ± 5% Is: 180 ± 5%

Effective serial number: Serial numbers suffixed with 05279 and above

Pages 3-5 and 3-7: Table 3-2. Parts List for IF Assembly, A1

C522, Was: Capacitor, fixed, mica, 150 pF, ±5%, 500 V dc — 1-900003-034 — 72136 — DM15F151J

Is: Capacitor, fixed, mica, 220 pF, ±5%, 500 V dc — 1-900003-038 — 72136 — DM15F221J

Add: C574 Capacitor, fixed, mica, 470 pF, ±5%, 500 V dc — 1-900003-047 — 72136 — DM15F471J

Page 4-3/4-4: Figure 4-1. Schematic Diagram, Model ODM-1

Was: C522 150 pF Is: C574 470 pF

Add: A capacitor, C522, 220 pF, from the junction of L506 and C524 to C574, with the curved side to C574

Add: A coaxial cable from the junction of C522 and C574, with the shield lead to P1-8 and the center conductor to P1-7

REVISED

APPROVED

CLASS CODE		
THE SINGER COMPANY LOS ANGELES OPERATION LOS ANGELES, CALIF.	TITLE ADDENDUM Model ODM-1	DWG. NO. 1- 500783-299 SHEET 2.1